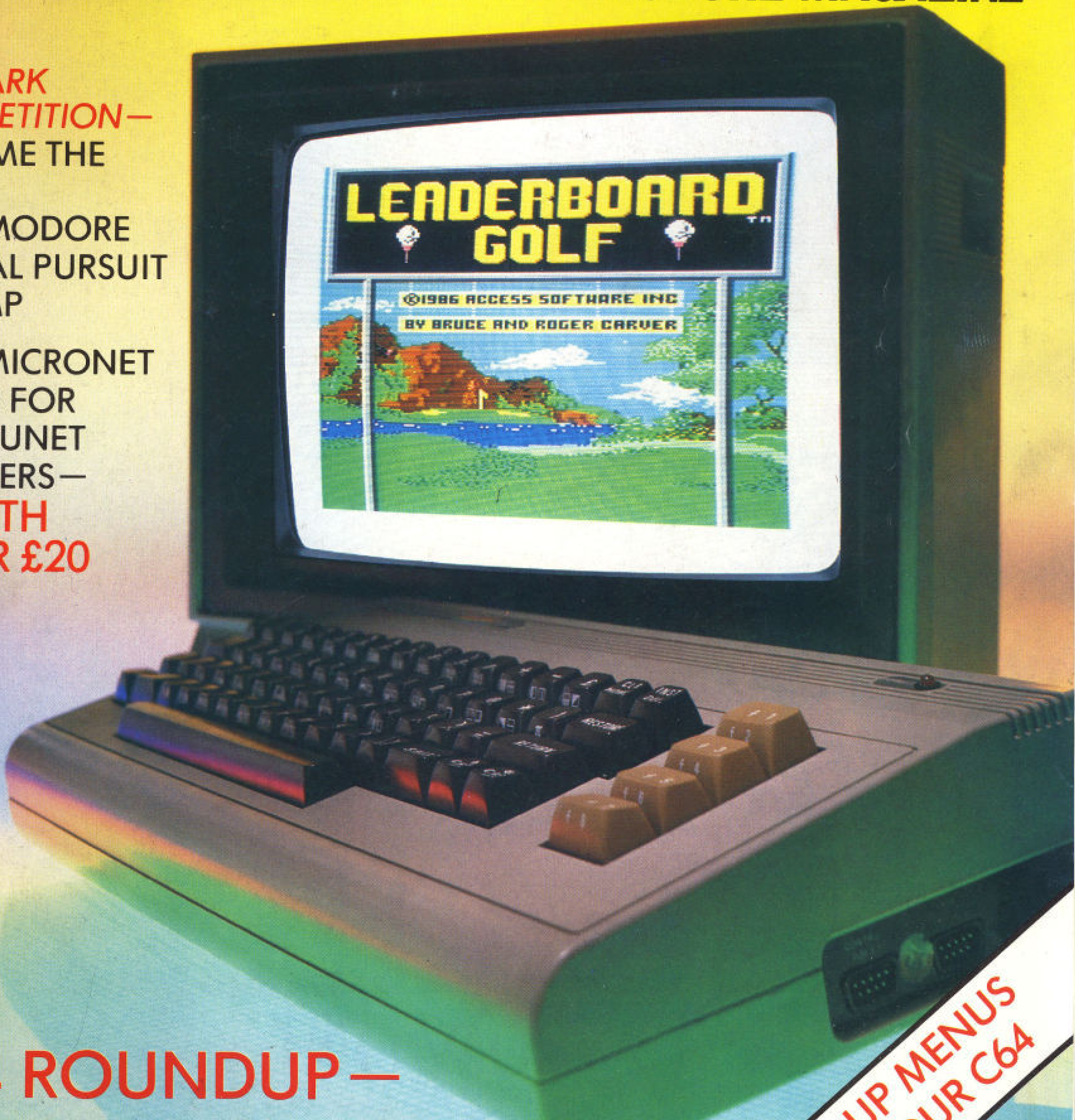
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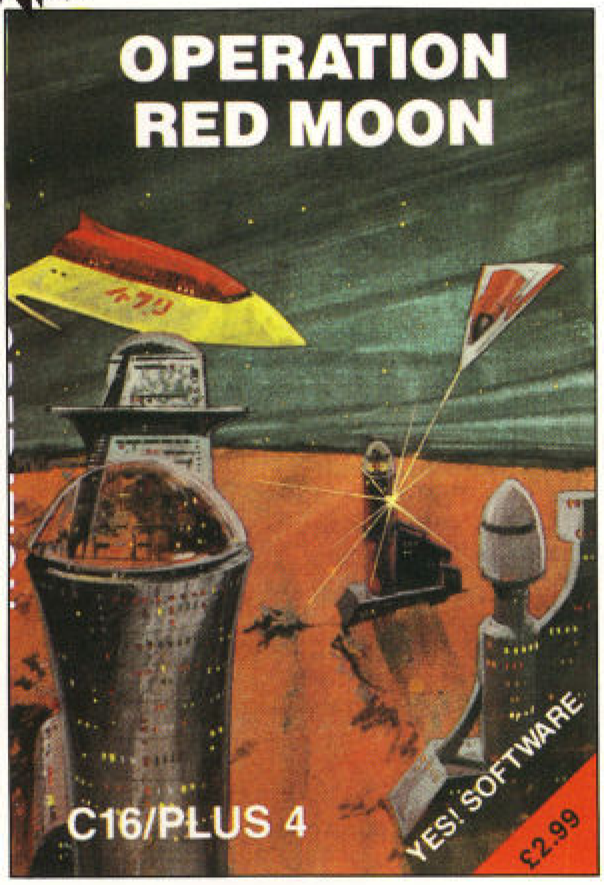
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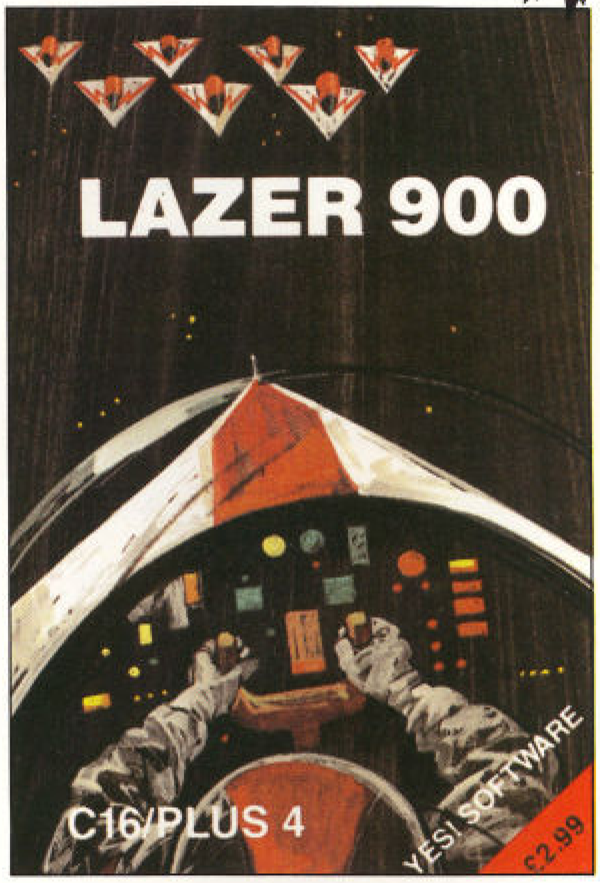
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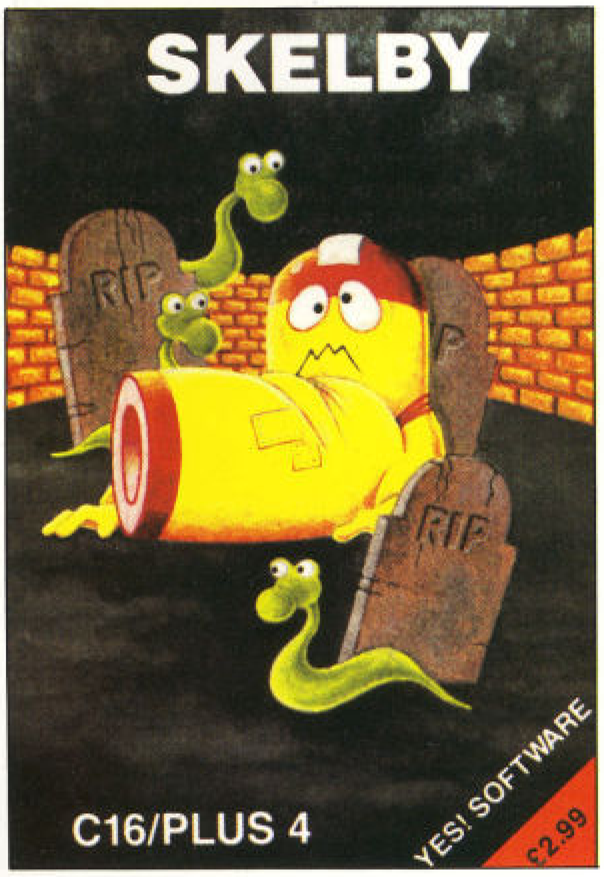
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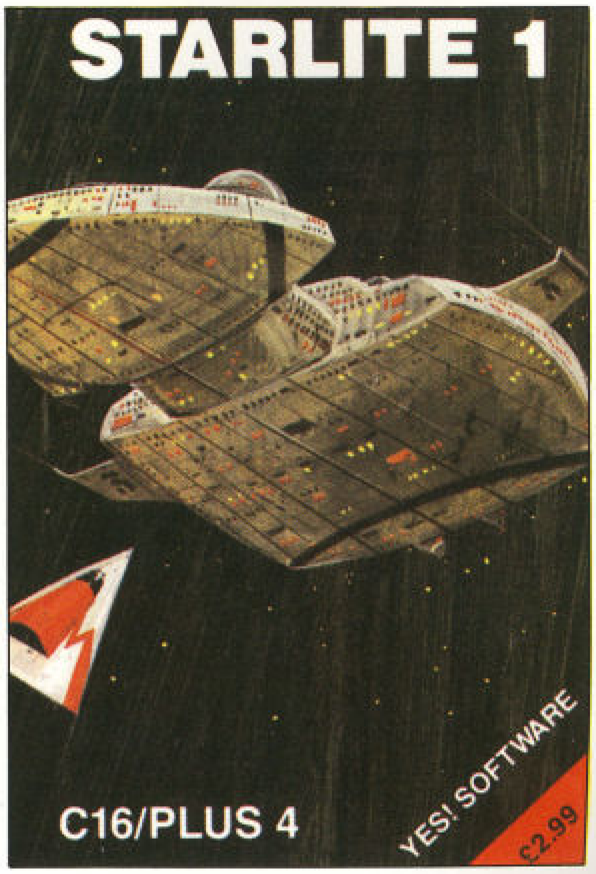
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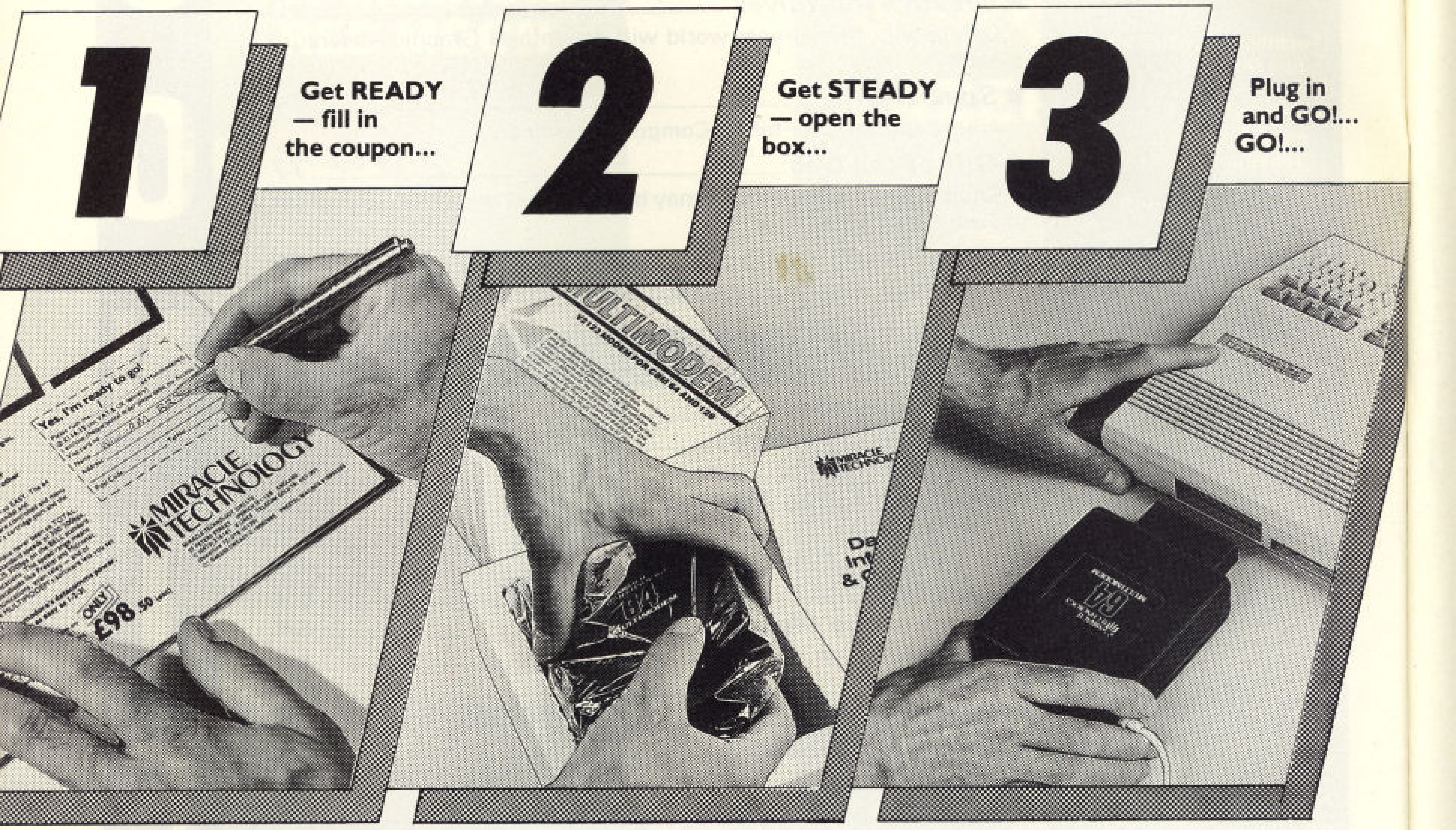
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DATA STATEMENTS

Spaced Out

AN UNHOLY ALLIANCE BETWEEN Hewson and Llamasoft, has resulted in the release of Iridis Alpha billed as a shoot-em-up with an intellectual twist.

John Gilby ship has to contend with thousands of Licker Liners, Zebedee Zonkers, Bubble Blasters and Cigger Cruisers.

The intellectual bit occurs when you progress to fighting on two planets at the same time. It's just been released and costs £8.95 on cassette and £12.95 on disk.

Still in Space, Gremlin has released Project Nova for the C-16/Plus/4. It's a space combat simulation in which you have the opportunity to be a space pilot.

There are 12 stages through which to progress, starting at novice and building up to the much coveted legendary status.

Star Trek has now been a cult TV series for 20 years and the official computer version will be launched in late September by Beyond. Francis Lee of Beyond said: "We are very proud to be playing such an important part in this major happening, and we have no doubt that the Star Trek project will be the most significant licensing deal signed this year."

Touch line

Hewson: Hewson House, 56B Milton Trading Estate, Milton, Abingdon, Oxon OX14 4RX. 0235 832939.
Gremlin: Alpha House, 10 Carver Street, Sheffield S1 4FS. 0742 753423.
Beyond: Wellington House, Upper St Martins Lane, London WC2H 9DL. 01 379 5682.





Show Calendar

The PCW Show 1986 opens its doors to the public on 5 September and according to advance publicity it will be the biggest and best yet.

Among the companies exhibiting will be US Gold, Firebird, Domark, Blue Ribbon Software, Cheetah, Elite and Mirrorsoft. New products include titles such as Express Raider, Gauntlet, Breakthru, Infiltrator and Trivial Pursuit.

The show will have a similar format to last year. The business and professional section can be found in Olympia II whilst the computing and leisure style stands are situated in the National Hall.

As a special attraction in the main hall, there will be Chartbusters – a giant video display of the year's best-selling games.

Tickets are available in advance for £2. Se Touchline for the address.

The show closes on 7 September.

Still on the subject of shows, have you any social engagements for January and February 1987? If not then you may like to keep 21-24 January free for the Third High Technology and Equipment in Education Exhibition and 17-20 February for the Which? Computer Show.

The THTEE is organised by EMAP Exhibitions and divides into five main themes: Training and employment, policy and planning, management and technology, teaching and technology and technology and special needs.

The Which? Computer Show, although attendees have become more computer literate of late, still maintains a reputation as one of the best places for beginners to start. The show has changed from its usual January dates in order to distance itself slightly from the Christmas and New Year hysteria which characteristically hits the industry and overshadows January events.

Touchline

PCW Show: Montbuild Ltd, 11 Manchester Square, London W1M 5AB. 01 486 1951.
THTEE Exhibition: EMAP International Exhibitions Ltd, Abbot's Court, 34 Farringdon Lane, London EC1R 3AU.
The Which? Computer show: Cahners Exhibitions, Chatsworth House, 59 London Road, Twickenham TW1 3SZ. 01 891 5051.

Print Outs

For those of you who will never manage to find the money to buy a laser printer, Microlease has brought new hope into your lives. For a paltry £70 per week you can hire a Canon LBP-8 Laser Beam Printer.

The Canon Laser printer provides quiet, crystal clear printing at a very fast speed and is compatible with most computer systems via the RS-232 interface.

The Canon Laser printer provides quiet, crystal clear printing at a very fast speed and is compatible with most computer systems via the RS-232 interface.

If you're shopping around to buy a printer then Datamyte Computer Supplies has some new additions to its range. There are three Silver Reed Daisy Wheel printers now available; the EXP 200 at £267, the EXP 600 for £540 and at the top end of the range is the EXP 800 at £799.

There are also new dot matrix printers from Panasonic; the KX-P1092 at £395. The KX-P1592 at £495 and the KX-P1595 at £695.

Hard Lines

Euromax is set to expand its range of Arcade and arcade turbo joysticks with three new models and a revised and improved version of the Competition Pro – now to be called the Euromax Micro Pro.

According to Euromax, there is a need for much better quality joysticks due to the increase in 'fast action' games. Euromax told *Your Commodore* "We have taken the opportunity to advance designs to achieve the absolute best in terms of accuracy, responsiveness, sensitivity and reliability".

The Elite (£15.95) is now available as is the new version of the competition Pro (Micro Pro at £16.95). The Arcade and Elite Plus (both at £17.95) will be in the shops soon.

The 1571 disk drive has come in for a lot of criticism because of its diabolical slowness. Firstline software has come to the aid of frustrated Commodore owners with the Enhancer 2000 disk drive. Claims for the Enhancer include: Commodore compatability, super high speed, one year warranty, exceptional durability, double density 3½", 35 track. The Enhancer 200 costs £137 including VAT and p&p.

Touchline

MicroLease: Forbes House, Whitefriars Lane, Tudor Road, Harrow, Middx HA3 5SS. 01 427 8822.

Datamyte: 52 Dery Street, Leek Staffordshire ST13 5AJ. 0538 383383.

Euromax: Pinfold Lane, Bridlington, North Humberside YO16 5XR. 0262601006.

Firstline: R.E. Ltd, 206 Great North Road, Eaton Socon, St Neots, Cambs PE19 3EF. 0480 213 969.

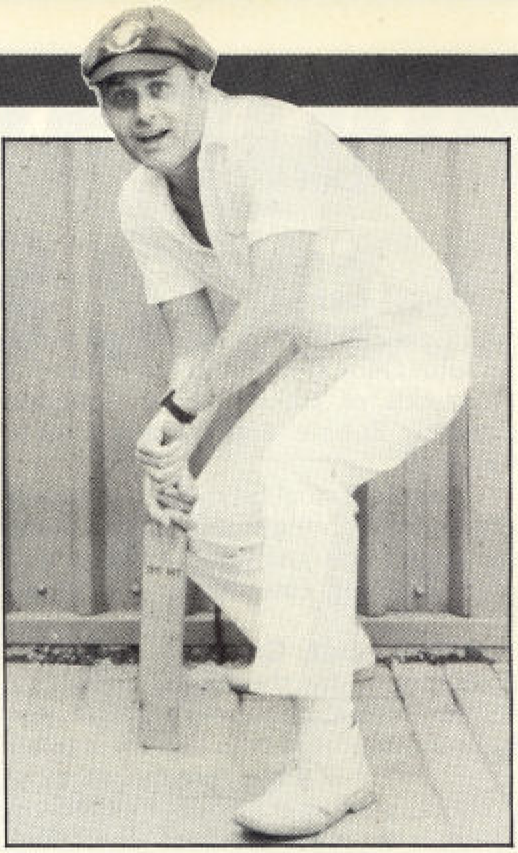


Gold Standards

The list of US Gold Autumn releases is incredibly long, here's the list: For the C64 there is Master of the Universe, Infiltrator, Hot Wheels, Wrestling, Movie Monster, Super Cycle, World Games, Xevious, Express Raider, Breakthru and Gauntlet. The C-16 is amply catered for with Winter Games and Summer Games.

Touchline

US Gold: Units 2/3 Holford Way, Holford, Birmingham B6 7AX. 021 356 3388.



That Sporting Life

Anco has recently released another C-16/Plus/4 game, signifying continuing support for these two computers. The new game is Winter Events and can be played by up to four players. There are six different events; biathlon, ski jump, bob sled, speed skating, slalom, downhill.

Winter Events cost £7.95.

Remember Graham Gooch Test Cricket from Audiogenic? If you don't then it's about to hit the streets again, if you do then you may be interested in an updated version.

Audiogenic's Heny Smithson said: "We aim to make Graham Gooch's Test Cricket into another hardy perennial of the software market by means of conversions and continuous improvement."

Alterations to the 64 version include changing the built in squads of England and Australian players and their averages to reflect the 1985 test series.

The cassette vesion costs £9.95 and the disk version is £11.95.

Melbourne House has now released a follow up to the immensely successful Way of the Exploding Fist. The new game, entitled Fist II: The Legend Continues is another martial arts game in which you use your skills to conquer the powers of darkness in the land. Your aim is to reach the volcano fortress of the evil warlord and dispose of him. According to Melbourne house "...a new breed of computer game is born". It's on cassette and costs £9.95.

Touchline

Anco: 35 West Hill, Dartford, Kent DA1 2EL. 0332 92513.

Audiogenic: 39 Suttons Industrial Park, London Road, Reading, Berks RG1 6AZ. 0734 664646.

Melbourne House: 60 High Street, Hampton Wick, Kingston-upon-Thames, Surrey KT1 4DB. 01 943 3911.

Generally Speaking

If you're a bit short of cash and feel that you need a new computer then maybe Ariolasoft is about to come to your aid. The Great Ariolasoft Spot the Screen Shot Challenge has recently been launched.

Every Ariolasoft game which you buy will contain a mystery screen shot and in order to win a fantastic prize you must name the game featured in the shot.

If you get your answer right then you could win a free game, a badge or money-off tokens. From there your entry will go into a prize draw (it's eligible even if you guessed the wrong game) and the grand prize is a computer.

You can choose from either a C128, a Spectrum 128, and Amstrad 6128 or an Atari 130XE.

Anyone out there with a pirate copy of Word Star, beware! The MicroPro Word Star amnesty has now come to an end after 750 disks had been returned for legitimisation.

Robin Oliver, Micropro's MD said: "Just for the record, I would like to repeat what we said at the time of the announcement of the amnesty, that we will not prosecute any of those people, neither will we disclose their names to anyone." He added: "The amnesty is now over, and we will take a severe view of software pirates that come to our notice, since we feel that we have been more than so far."

Still on the subject of crime, there's a new home burglar alarm system which may save you losing you precious Commodore computer.

Autolarm, from Raceamble, is a new home and commercial security system which can be installed by the user with the aid of just a screwdriver.

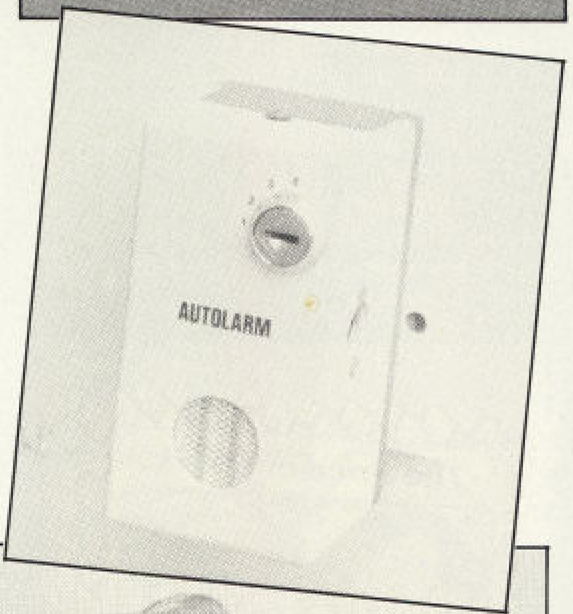
The Autolarm controller forms the heart of the system, it has a powerful internal siren (battery powered) and a key switch with over 2000 different keys.

The controller can be used alone to warn if your computer is unplugged or the mains lead cut. The controller costs £45 and a whole system can be bought for less than £200.

Citizen Europe, makers of printers, have been going round doing their bit for education in this country. The company recently donated 20 printers to the local education authority for use in schools in the Uxbridge area. Miora Kizawa, MD of the company, the mayor of Hillingdon recently attended a ceremony to had over the printers, accompanied by members of Greenway Secondary School.

Touchline

Ariolasoft: 68 Long Acre, Covent Garden, London WC2E 9JH. 01 836 3411.
Micropro: Haygarth House, 28-31 High Street, Wimbledon Village, London SW19 5BY.
Raceamble: 5 Larkstone Crescent, Ilfracombe, Devon EX34 9PJ. 0271 62801.





Next Month

NEXT ISSUE, *YOUR COMMODORE* will have a bright new look. A look that will be more in tune with the country's most discerning computer owners. Yes, we mean you!

Over the past month or so, completed readers survey forms have been flooding into our office. We're very flattered to find that, by and large, you think we've got it about right. Of course there'll be a few minor adjustments here and there, but you'll still find all your favourite features.

You'll also find something else too! Because next issue, to mark our sophisticated new look, we'll be giving away a **FREE** cassette packed with software to suit every taste, to run on a C64 (or C128 in C64 mode).

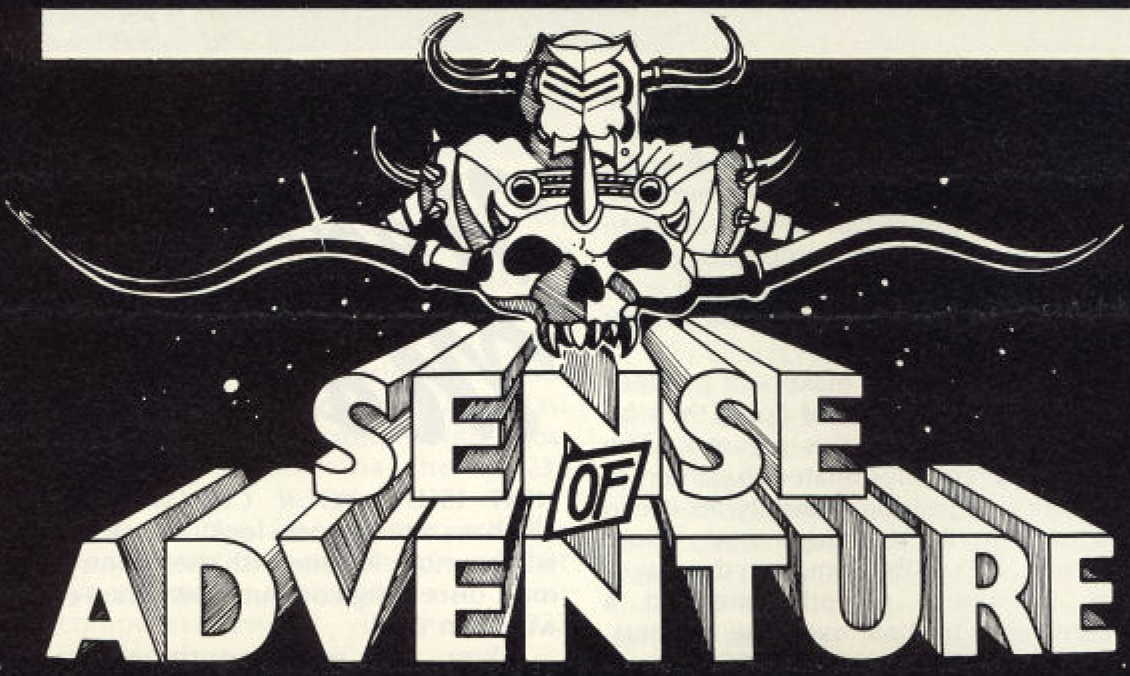
Firstly, there'll be an exclusive game written by Tony Crowther, one of the UK's top games writers. Called *R1-D1*, the game puts you in control of a robot droid which you have to try to guide out of an enemy complex. Needless to say, there are lots of enemy droids trying to stop you from doing just that! As you'd expect from a Crowther game, the action is fast and furious and the sound track superb!

The second program is a *Basic Extension*. Anyone who's programmed on the C64 will have craved the sophisticated toolkit commands as found on some rival micros. You know what we mean: RENUMBER, to help tidy up programs; AUTO, to relieve you of the bind of typing line numbers yourself; and TRACE, to help you find out why your latest masterpiece just crashed. The *Your Commodore Basic Extension* will have these and more – in fact no fewer than 27 new commands to make program design and development so much easier.

Finally, those of you with disk drives should not be without the *Your Commodore Disk Utility*. It will give you a wide range of powerful commands to aid your disk usage. You will be able to change Headers and IDs on all disks, change the LOAD address of any programs, even protect your disk from prying eyes, plus lots more.

So don't miss the November 1986 issue of *Your Commodore*. Cancel that holiday, forget the new car – picket your newsagent instead!

■



Runecaster casts a critical eye over the latest releases on the adventure scene.

FOR SOME TIME THERE WAS A definite gap in the flow of new adventure games for the C64. This error on the part of those who control our spare time entertainment seems to have been rectified to such an extent that there now appears to be almost a glut of releases to attract our attention.

There have been several re-releases of programs originally for other computers and a fair number of brand new titles from well known software houses. Mastertronic has done it again with the 64 version of an Old Spectrum game called *Kentilla* – at £1.99 this has got to be worth buying. *Bored of the Rings* from CRL was also a Spectrum winner and has at last appeared for the 64.

Doomdark's Revenge – another Spectrum chartbuster – a game of adventure/strategy par excellence from Beyond, looks all set to keep many a 64 user tied to the keyboard for weeks of fantastic derring-do! Most of the better games today appear as conversions for several computers almost at the same time and it is good to see that several software houses are prepared to persevere with conversions of yesterday's winners.

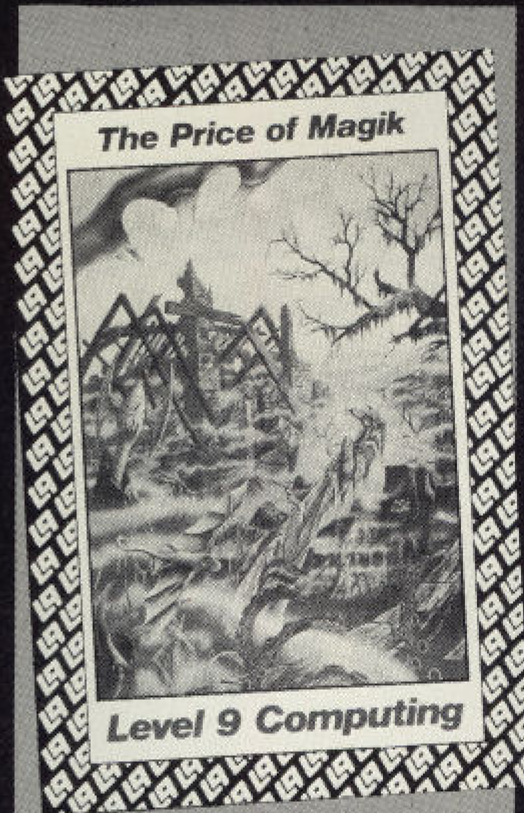
New releases include *Borrowed Time* from Activision, *Pilgrim* and *The Very Big Cave Adventure* from CRL, *Mystery Voyage* from Colleen – newcomers to the adventure scene – the fabulous *Ultima IV* from US Gold, and of course Level Nine's lastest, *The Price of Magik*.

The Price is Right

Could this be Level Nine's best yet? *The Price of Magik* is a sequel to *Red Moon*, their award winning game of 1985. The action nearly all takes place within the confines of The House of the Red Moon and the crux of the game is your search to find and defeat the evil sorcerer Myglar.

There are no pure treasures to find and no score is given, although SCORE is recognised and will elicit a report on your present sanity and apparent age! The aim of the game is to learn (and find a use for) some 18 odd spells that will finally enable you to neutralise the powers of the wicked Myglar.

Level Nine's last game was *The Worm in Paradise* and this set a new standard for adventures in this country. A vocabulary of over 1000 words, a parser that makes sense of complex sentences and an operating system that permits the typing in of commands even whilst pictures are being drawn on the screen (multi-tasking).



The Price of Magik has all this and more. It also incorporates RAM SAVE and RAM RESTORE which enables the player to rapidly 'save' and subsequently 'restore' the game position to/from a section of the computer's memory. A very useful facility if you anticipate a dangerous move or decision ahead! The RAM SAVEd position is lost when you switch off the computer and is not recorded if you perform a tape SAVE.

Another Level Nine first sees the light of day in this program – the command OOPS. This is not so dissimilar to RAM SAVE as it enables you to return to your last previous location. Very useful if there are a number of chests to open and some of them explode and reduce yor stamina (hit points). OOPS and it never happened!

Your stamina is fairly important, as there are several unpleasant creatures that will not let you past without a fight. A weapon and some form of armour are useful finds before you get too involved! Magik may also help and bear in mind that simple killing in such an environment might release your opponent's ghosts – who may not be all that friendly to you in the future?

Some creatures may be controlled by you. Needless to say, Magik will be a definite plus for this. Learning to use each of the 18 spells requires knowledge of both the type name of the spell – ZAP, FLY, HYP etc. and the object that will enable you to 'focus' your powers to perform that particular Magik. Clues found along the way will supply the type name and trying to CAST XXX will tell you what else is needed to make that spell work.

This is also the first adventure game to be protected against piracy by using the Lenslok system. This requires a plastic prismatic lens arrangement (supplied with each game), that converts what appears on the screen as a graphic jumble into a readable two letter code. This code is entered and if you have it correct, then the program continues. If not then you have to try again until you get it right.

At least in 'The Price of Magik', you get a second, third, fourth (and on) chance to get the Lenslok code right. Some programs using Lenslok NEW the program if you do not get the code right! Upper case characters seem to be fairly easy to identify but I found that the lower case characters very difficult to read. Just take care, read the instructions, get the lens the right way up and all should be well.

This adventure is probably the best yet from Level Nine, the graphics are drawn quickly and the text is up to the usual high standard. The idea of finding spells rather than a series of treasures is clever and keeps the mind sharp throughout. Although most of the clues and necessary items to make the spells work are perfectly logical, Level Nine's own brand of humour is never far away.

Even if you feel you are coping reasonably well, never forget that Level Nine will provide comprehensive clue sheets on receipt of a stamped addressed envelope and the hint request form that comes with every game.

These clue sheets are by far and away the best I have ever seen. They consist of hundreds of numbered references of which two sections are lists of objects and places. Look up an object or place and you will be directed to additional numbered references that will provide a hint together with additional references.

All the answers are jumbled up, so that looking up one clue will not draw your eyes to answers you do not wish to see. Even if you want to cheat heavily, the clues will only point you in the right direction and NOT give you a definitive answer to the entire game. Brilliant!

There are often a number of red herrings within these clues. You may spot a Three Headed Minotaur mentioned next to the Trumpet you are looking up; but there is no guarantee that such a creature is actually part of the game! I wish other software houses could learn just how sensible such a system of self help clue sheets can be.

The only sadness I feel in seeing a new adventure from Level Nine is that this means we have to wait at least three or four months before we see the next one!

Lost At Sea

Colleen is a relatively new software house, based in Wales and not across the Irish Sea as the name would lead you to expect. Having produced an interesting and instructive music disk for the C64 that includes a guitar tutor, SID chip tutor, drum machine and a music creator, it is not surprising that the first adventure program from this company features sound rather than graphics.

Mystery Voyage is available on both tape and disk and is a three part adventure requiring codes learnt in one part to continue to the next. The ship in which you are travelling founders in rough seas leaving you alone on a rickety raft admidst a number of small islands. Can you survive long enough to escape alive?

First you must find a series of treasures to appease a sea monster who blocks your path to freedom. This is no easy task, as to add to your troubles, you have no food or drink, without which you will surely perish.

The location desciptions are detailed and set the scene well, with the occasional sound effects adding to the mind's impression of the places visited. The puzzles are in the fairly classic mould, with certain locations not accessible until the right objects/actions have been located/performed.

There are a number of clues that will put you on the right path and the puzzles, while not particularly difficult, must be solved in the right sequence – or you will die of hunger or thirst. Mapping is important and read the descriptions carefully to distinguish the difference between certain watery locations!

The command parser is of a simple nature, generally reacting to a straight verb/noun input. There is very little interaction with the creatures you meet although talking to some of them is important. Examining objects is vital to the game but only a few give much in the way of additional information.

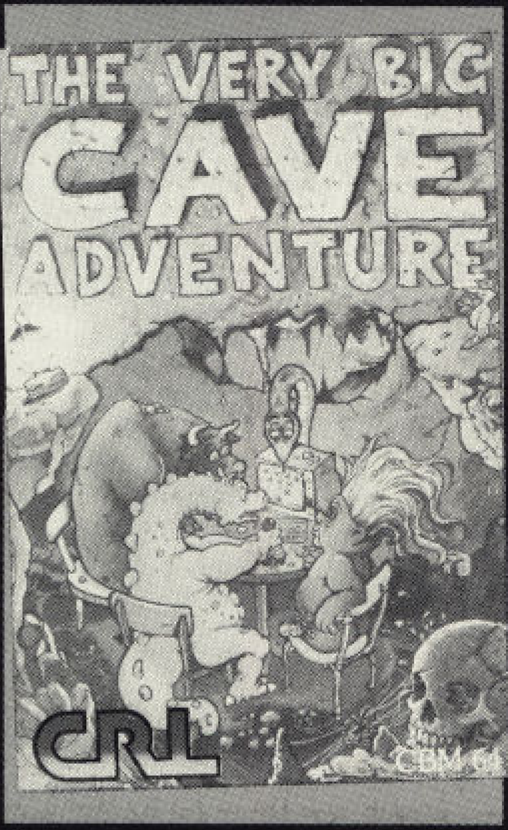
This may be a good game for novice adventurers, as the lessons learnt here will stand them in good stead when they come to tackle a more devious plot in the future. There are plenty of locations to visit and map right from the start and frequent use of the SAVE facility is to be recommended – preferably just after you have been fed and watered!

The sound effects may be switched off, which is probably a good thing. After the first few hearings they become a nuisance, purely because they have been programmed in direct mode and you have to wait for them to finish before you can type in any new commands. Future programs from Colleen will probably have these effects in background mode using the interrupts, allowing a multi tasking similar to that used by Level Nine's graphics.

It is good to see a new software house producing adventure games and although this one will not reach the top of the charts, the game is sound (!) and hopefully will be the first of many.

Neo Classic

As we are often telling you, THE classic adventure is that of the colossal caves



from way back then, written by Messrs Crowther and Woods. There have been a number of reincarnations of this game for the C64, some better than others. We now have yet another version, this time from the fertile minds of St Brides and distributed by CRL.

The Very Big Cave Adventure is distinctly different.

Your guide and mentor around the caves is none other than Trixie Trinian, kitted out as usual in boater, blue gymslip and black stockings. Judging by the mud around, she is also wearing her wellies! Anyone who has played one of the serious versions just has to get this one.

It is written using *The Quill*, *Illustrator* and *The Patch*, all from Gilsoft and shows just what sort of professional products these adventure writing utilities can create. The graphics are good, appear quickly and the descriptions full and highly amusing. The whole adventure is completely recognisable as a *Colossal Caves* derivation but the entire game is full of minor alterations that make it a joy to play.

For those that have enjoyed these caves before, there will be many surprises! Trixie and her friends have been there before you, and have altered many of the puzzles – rotten little devils. There are some of the original treasures remaining but you may also find such gems as the odd Chippendale table to pick up as well.

For those that are new to the caves just lean back and enjoy a zany treasure hunt with an amusing guide. The game is well put together and has all the latest add-ons that come with Gilsoft's *Patch*, most useful of these is the RAM SAVE. This is very rapid and will save using up too much of your lamp's fuel whilst you are trying to sort out how to catch that dratted bird!

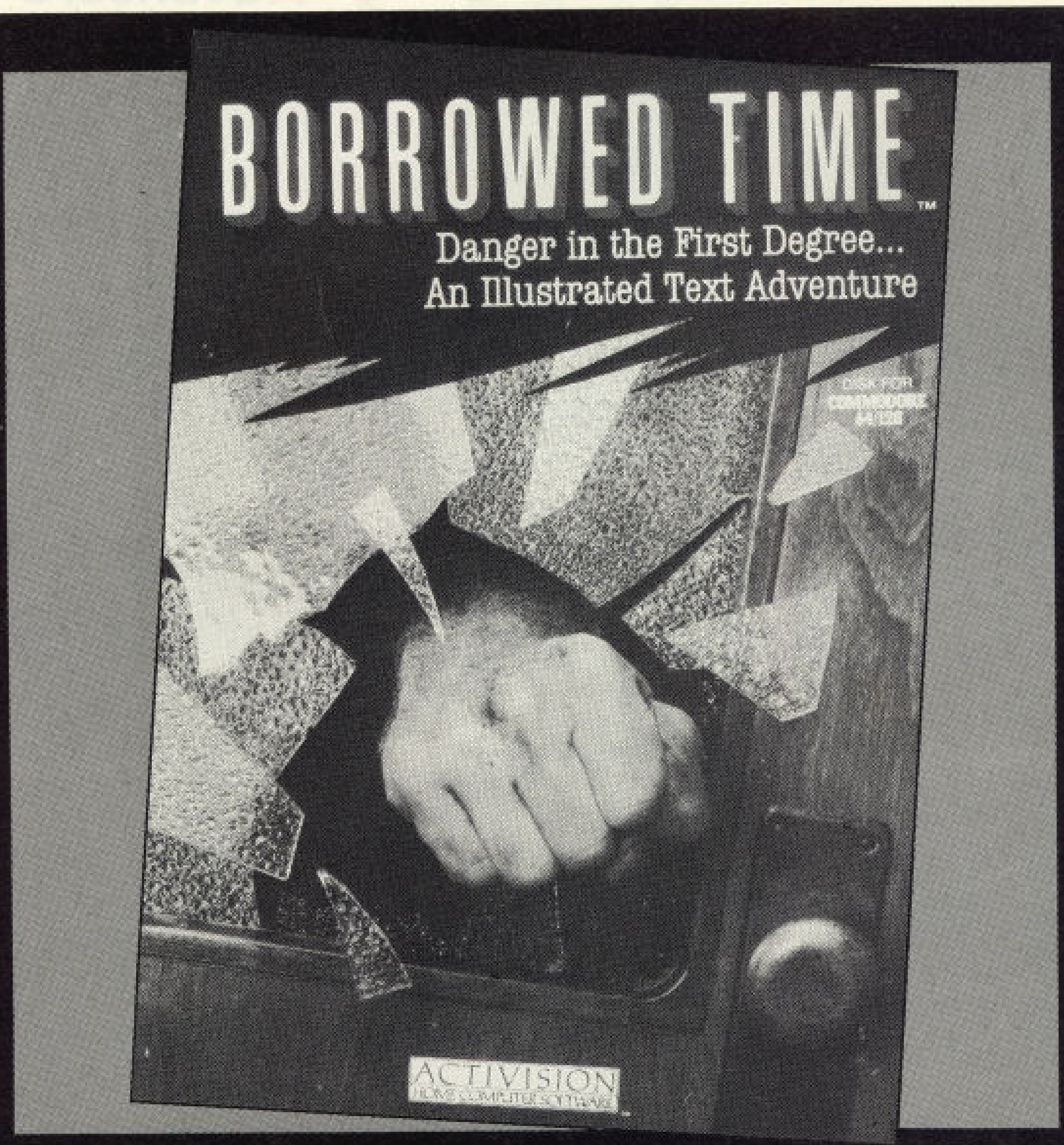
The program has a fast loader and because of its size, the game is played in two parts, but you must SAVE your position either to tape or disk before leaving the first spot. This will ensure that you have all the treasure and any vital objects you need to carry through to the second part. The second part has strong overtones of Alice in Wonderland, complete with tardy, chattering rabbit.

Throughout the adventure beware of words that have a double meaning. Where a word may be understood in more than one way expect the least likely interpretation. The vocabulary understood in each half is not extensive neither does the program understand complex input commands. For all that, there is a feeling of depth to the game with plenty of items to examine and a good range of responses.

One of the 'magic words' from the original cave adventurers was PLUGH, transporting you from one location to another. Type this in here and you will get a 'plug' for St Brides next game. I can hardly wait!

Find The Lady

One type of now standard adventure is based on the detective story. There have



been several published, ranging from Infocom's *Deadline* through Melbourne Houses's *Sherlock* and in a way including Activision's *Mindshadow*. The latter just barely creeps in, although in the strictest sense it is not quite a detective game as the solution is quite tightly defined – providing you have solved the puzzles in the right order.

Activision has now released a top of the range detective game – *Borrowed Time*. This is a disk based program for the C64/128 and if this genre is your kind of thing – buy it. You play the part of private eye Sam Harlow and initially you do not know what problem you have to solve! You start in your office, just two rooms; one for you and one for your girl Friday, Iris Spencer.

There are plenty of hints suggesting that someone is looking for you and a very brief phone call where a voice gasps out: "Sam, they want you dead...". You must not only stay alive but find out what is the root of all these problems and solve the mystery.

Borrowed Time is unusual in offering the facility of either using they keyboard in the usual way or a joystick. The screen is divided into four parts. One, just over a quarter, displays a good graphic picture at the present scene. Beneath this is the text window, used for your input commands and the computer's responses.

On the right of the screen is a list of verbs/nouns accessed by a pointer (with the joystick) and above this, pictorial icons of objects held, together with a compass rose for joystick directions.

I found the use of a joystick completely superfluous, as many of the words I wished to enter were not on the limited list displayed. It was also easier to enter the single letter 'E', to travel east, than to position the pointer over the correct part of the compass. Perhaps I'm old fashioned and you will think otherwise.

The graphics are very good, clear and readily understood. Good use of sprites give many of the screens the quality of moving pictures – washing blows on the line, heads move in the crowd and faces grimace under gags. They may be turned off, but often show something that will trigger an important action, so are best left on!

The text often over-runs the text window and RETURN has to be pressed to display the rest of the message. For this reason alone, I would rather have access to the entire message rather than the option of limited joystick commands (which takes up the additional space).

Starting in his office, Sam Harlow can look at his files about his last few cases and generally explore his two rooms – Iris is out at the moment. On leaving the office, he is attacked by two gunmen and stands a very good chance of being shot dead!

Fortunately the game starts again very quickly and you can try again, there is also a QUICKSAVE option that will enable you to skip over the first few moves that you feel must be taken before his hasty demise. His actions are severely limited within the first five locations and perhaps I am just not cut out to be a detective but it took me the best part of two hours before I could break the pattern of being killed within only a few moves from the start!

In case you have the same experience, the answer to this problem is MPDL UIF EPPS at location number five. This will give you time to do what I was trying to do for the best part of those two hours! Believe me, there are plenty of further opportunities of getting killed but at least you can have the chance to wander around the city and learn something before it happens!

The input command parser is quite intelligent but for the most part a straight verb/noun input will be quite sufficient, with the program cleverly interpreting what you have in mind and acting very much as your co-pilot. Text descriptions and responses are detailed and explain a great deal as you proceed, keeping the pressure going all the time.

There is the option for nine SAVE GAME positions (accessible via function key 1). use them. Mapping is also important, as there is always the possibility of sudden death around the corner and you will not have time to backtrack all that often to check your psoition. Keep a notebook handy to make notes of car/house numbers etc. for the same reason.

Many of the people mentioned in the case files in your office will turn up during your investigations – again, a few notes will help refresh your memory. I'm not sure whether it will be important, but do remember that this is an American program, so watch your language! What we would call blinds, they call shades; a cheque is a check and so on. Most important objects are shown in text on the screen so you can check the spelling.

A fascinating type of adventure with both good graphics and good text and most important of all a riveting story line. For all that I prefer my trusty sword to Sam's finely crafted gun, this is some program.

Exodus Plus

As you will have seen in our special feature in the June issue, *Ultima IV* is n ow available, certainly as an American import at £49 but also should be out in its British form from US Gold at considerably less. If you like wielding a sword in fantastic lands with a quest to keep you going for weeks – look it out, its worth getting a disk drive specially to play it!

Exodus: Ultima III has been out for some time now and is well worth searching for. I've even seen it on offer for as little as £3.95 (bankrupt stock). If you have had trouble solving this one, you might try giving my friend 'Dart, the mighty finder of marks and cards' a buzz on 0442 832593. If he can remember that far back – pre *Ultima IV* – he may be able to give you a useful tip or two!

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POP UP MENUS

Lionel Jack provides a handy menu routine for C64 owners.

You've all seen at some time how pop-up menus can really give programs a look of professionalism. Well now you can achieve the same affect in your own programs. This utility allows the user to call a number of pop-up menus of his/her own design to enhance their own screen display which is returned to its original state when the menus are erased.

Machine Code

Although the work horse of the program has been written in Machine Code (for obvious speed) it has been designed to be accessible from Basic.

Before you can use the program you must type in the machine code loader program. This program is not too long and has an automatic save facility at the end (tape or disk) so that you are just left with the source code for quick, easy loading from Basic.

Demonstration

Once the Machine Code is saved you can type in the small demonstration program to see just what the program is capable of. This routine has been written on a very simple level just to give you an idea of how everything works. The number, size, colour and position of your own menus is completely under your own control. Refer to Figure 1 for a complete breakdown of the demonstration program.

You will find a short delay when you run the demo. This is just the computer reading the text into memory, this means that the menus will appear almost immediately when called later in the program.

Designing your own menus

When designing your own menus there are just five parameters that you must pass to the M/C to get the size, colour etc. that you require. If you examine the demonstration program these parameters are:

L: The number of lines that you want in your menu. Always add two to the total that you require to allow for a border across the top and bottom.

W: This is the width of the menu. Again add two to your total to allow for a border down the sides.

C: This is the colour of the shadow of the menu. The program will automatically make the foreground of the menu the next higher colour in the Commodore colour table. If you therefore choose 0 (black) as the shadow then the foreground will be 1 (white).

B: This indicates which menu you wish to display. I'll discuss text later but for now all that you need to know is that the menu numbers correspond to the order in which the text appears in the DATE statements (lines 500-570 in the demo). In other words if B=3 then you will get the third block of text in the menu.

SA: This is the start position of the top left hand corner of the menu. It should be equal to a screen memory location. For your information location 1024 is at the top left hand corner of the screen, you should be able to work out the rest from there.

Figure 1

LINE	DESCRIPTION
5	LOAD M/C (change device to 1 for tape).
10	N = Number of menus.
20	POKE 679,0 to protect original screen.
30 - 50	Set up parameters for each menu.
60	POKE 679,1 to restore original screen.
100 - 140	Pass parameters and call M/C to print menus
200	Convert menu address to POKE numbers.
500 - 570	Read text for menus and store in memory

Entering Text

The only other thing you need to know is how to set up your text. You may have as much text as you like in each of your menus, as long as it will all fit on the screen, but care needs to be taken that it appears exactly how you want it to.

PROGRAM: DEMONSTRATION

```
1 REM POP-UP DEMO. CMB/64....L.JACK.
1986
5 C=C+1:IFC=1THENLOAD"BPOP",1,1
10 N=3:GOSUB500
20 POKE679,0:SYS49152:REM STORE CURRE
NT SCREEN
30 L=6:W=10:C=0:B=1:SA=1238:GOSUB100
40 L=10:W=3:C=7:B=2:SA=1106:GOSUB100
50 L=4:W=18:C=11:B=3:SA=1388:GOSUB100
60 POKE679,1:SYS49152:REM RECOVER ORI
GINAL SCREEN
70 END
100 REM POKE IN PARAMETERS & CALL M/C
110 POKE679,L:POKE680,W:POKE681,C:POK
E682,41-W:GOSUB200
120 POKE252,A(0):POKE251,A(1):POKE253
,A(1):POKE254,A(0)+212
130 SA=BOX(B):GOSUB200:SYS49251:W=W-2
140 POKE253,A(1):POKE254,A(0):POKE682
,41-W:SYS49404
150 GETY$:IFY$<>"C"THEN150
160 RETURN
200 A(0)=INT(SA/256):A(1)=SA-A(0)*256
:RETURN
500 AD=49461:FORK=1TON
510 BOX(K)=AD
520 READA$:FORJ=1TOLEN(A$):P=ASC(MID$
(A$,J,1))
530 IFP=42THEN550
534 IFP>64THENP=P-64
540 POKEAD,P:AD=AD+1:NEXTJ
550 NEXTK:RETURN
560 DATA"HERE'S A POP-UP  TESTER PRES
S C *"
565 DATA"PRESS C *"
570 DATA"O.K. NOW RESTORESCREEN...PRE
SS C*"
```

When writing your text as DATA statements (see demo) you might need to place extra spaces between words or even have words connected (see line 570 in demo). This is only to make sure that the text is correctly spaced in the menus. Plan your menus carefully before you enter the DATA statements and you should have no problems.

You may have noticed that the text data in the demo has an asterisk (*) at the end of each line. This merely an indication to the computer that this is the end of the text for a particular menu. As my demo is pretty short my text for each menu has not gone over one line, but as I suggested earlier your text may be as long as you like and may therefore require more than one line to get it all in. Make sure that you place an asterisk at the end of every menu.

Of course if you wish to use the asterisk within your text you will have to change the end of menu signal to another character. A good character to use is '@'. If you use this change the 52 (character code for '*') in line 530 of the demo to 64 (character code for '@').

On Your Own

Remember to always protect your current screen (line 20) before printing a menu and recover it (line 60) whe you want to clear the menu.

Do not be intimidated by this explanation, it really is quite simple to produce your own professional looking pop-up menus and it's certainly worth the effort. You can see how short the demo is so try it first and refer to it when you write your own routines.

A little practice and you'll be pleased you tried.

PROGRAM: M/C GENERATOR

```
1000 PRINT "(CLR)(DOWN)(DOWN)  MACHINE
 CODE GENERATOR - WORKING.."
2000 FORL=0TO19:CX=0:FORD=0TO15:READA:
CX=CX+A:POKE49152+L*16+D,A:NEXTD
2010 READA:IFA<>CXTHENPRINT"ERROR IN L
INE";2040+(L*10):STOP
2020 NEXTL
2040 DATA172,167,2,169,204,133,254,169
,0,133,251,133,253,169,4,133,2346
2050 DATA252,192,0,240,62,32,92,192,23
0,251,208,2,230,252,230,253,2718
2060 DATA208,2,230,254,165,251,201,231
,208,231,165,252,201,7,208,225,3039
2070 DATA192,0,208,7,173,134,2,141,171
,2,96,173,171,2,141,134,1747
2080 DATA2,160,0,153,0,216,153,255,216
,153,254,217,153,233,218,200,2583
2090 DATA208,241,96,162,0,161,251,129,
253,76,24,192,162,0,161,253,2369
2100 DATA129,251,96,160,0,140,172,2,17
3,167,2,72,165,251,72,165,2017
2110 DATA252,72,172,168,2,162,0,169,16
0,129,251,173,169,2,129,253,2263
2120 DATA136,240,13,230,251,230,253,20
8,236,230,252,230,254,76,117,192,3148
2130 DATA206,167,2,240,19,165,251,24,1
09,170,2,144,4,230,252,230,2215
2140 DATA254,133,251,133,253,76,114,19
2,238,172,2,173,172,2,201,2,2368
2150 DATA240,43,238,169,2,104,133,252,
104,133,251,133,253,104,141,167,2467
2160 DATA2,165,252,24,105,212,133,254,
173,167,2,56,233,2,72,165,2017
2170 DATA251,72,165,252,72,165,251,24,
105,41,76,155,192,104,133,252,2310
2180 DATA104,133,251,104,141,167,2,173
,168,2,56,233,2,141,168,2,1847
2190 DATA165,251,24,105,82,144,2,230,2
52,133,251,96,172,168,2,162,2239
2200 DATA0,161,253,24,105,128,129,251,
136,240,15,230,251,208,2,230,2363
2210 DATA252,230,253,208,2,230,254,76,
255,192,206,167,2,240,21,165,2753
2220 DATA251,24,109,170,2,144,2,230,25
2,133,251,230,253,208,2,230,2491
2230 DATA254,76,252,192,96,0,0,0,44,83
,0,83,0,83,0,83,1246
3000 REM ** READY TO SAVE **
3010 PRINT "(DOWN)(DOWN)     ANY KEY TO
 SAVE"
3020 GETK$:IFK$=""THEN3020
3030 POKE 43,0:POKE44,192:POKE45,57:PO
KE46,193
3070 SAVE "BPOP",8
3080 REM CHANGE ,8 TO ,1 FOR TAPE USE
```

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Commodore 128. Starting Basic Book 1
Sean Gray
Glentop
£5.95

This lively book forms an ideal companion to the 128. The author has made a determined attempt to break away from the textbook style without getting too light in his approach.

Gray approaches his subject from the standpoint of a total beginner, playing around with the keyboard first of all and rapidly meeting syntax errors. After this introduction the book concentrates on the Basic commands in a programming environment. This means that it introduces each set of commands within very short games programs explaining their purpose and full syntax. Some chapters set exercises to give you a chance to see how much is sinking in.

All of the listings which incoroporate graphic symbols use a special form of notation, similar to the listings in this magazine, and the meanings are explained in one of the book's appendices.

When the graphics and sound commands are introduced the book takes time to explain the principles involved with easy to understand diagrams. All the time the author encourages you to stand on your own two feet and not just to allow yourself to be spoon fed.

This becomes apparent in the closing chapters where Gray shows how to plan a program. Each section of the program is listed individually and dissected so that each project is fully described and justified.

For newcomers to computing via the C128 this book provides a useful introduction and at just under £6 it offers excellent value.

The Official Commodore 128 Personal Computer Book
Mitchell Waite, Robert Lafore, Jerry Volpe
Sams (Macmillan)
$12.95

This is a very general book on the C128, more of an expanded brochure than a manual. Much of its time is spent talking about the various modes and applications of the 128. Apparently aimed at the first time user this is not a book for first time buyers. The text does go into graphics, sprite and music commands but much of its 200 pages are concerned with describing the computer, its facilities and general architecture.

In many places it is not an easy read, relying more on verbal description rather than examples but this problem is eased slightly by the use of colourful diagrams when applicable.

If you're getting the impression that I disliked this book they you're wrong. I'm just a little doubtful where its market would lię. For the uninitiated it is a bit heavy in places, for the technical buff it has something to offer but once read there is little to be gained by re-reading.

It is the sort of book which should be given away with the computer. It falls between the stools of being a book for beginners and one for experienced users. One useful section concentrates on the CP/M operating system and its related commands but another describes the types of application software available.

Most of the information can be gleaned from various magazine articles and at the price there are many better bargains appearing on the market with a meatier content.

Oxford Pascal on the Commodore 64
Ian Sinclair
Cassell Computing
£7.95

This is the official guide to the Pascal compiler marketing by Oxford Computer systems (Software) Ltd and deals with both the cassette and the extended disk versions.

Ian Sinclair is a prolific writer of books on all aspects of computing and this shows

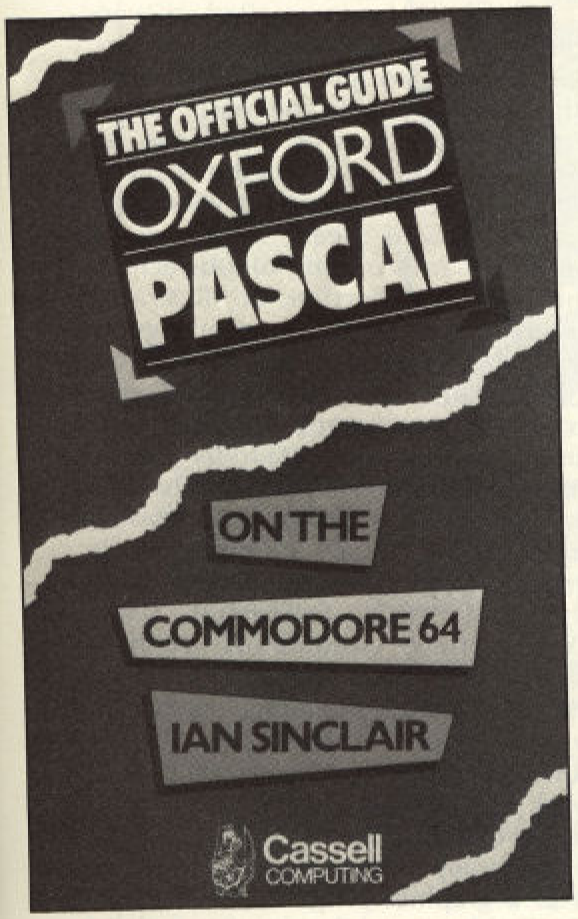
in the clear, concise style. Throughout the book he takes every opportunity to try to sell the advantages of Pascal over Basic and a very convincing argument it makes.

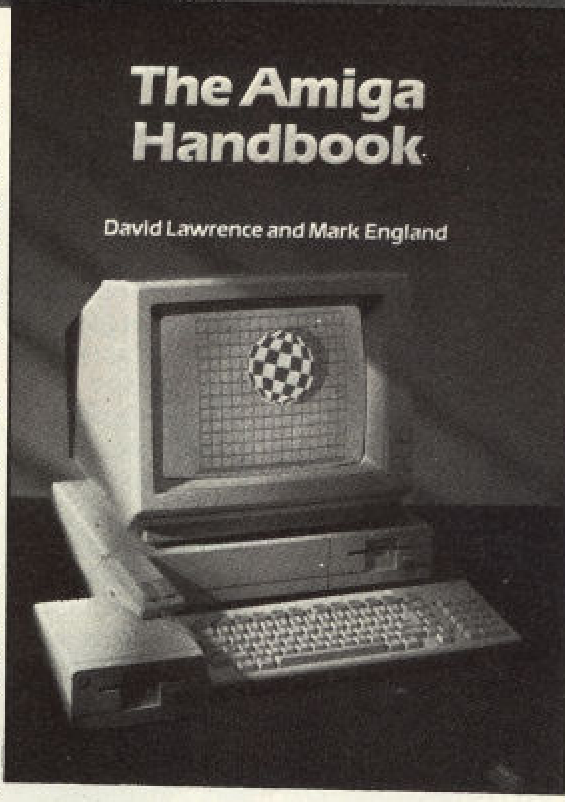
Oxford Pascal is written specifically for the features of the 64 which means that extra commands are available for graphics or sound and for incorporating machine code routines within a program. Sinclair covers all of these areas along with the more usual commands in just enough detail to set the reader on the path to the structured programming which Pascal demands. All keywords are highlighted in bold capitals which makes browsing a delight.

Example programs are used to illustrate the correct syntax and structuring and the author has kept them short to allow the beginner to see what is happening without having to type furiously for an hour beforehand.

Where the tape and disk versions vary a suitable note is made but sensibly the majority of these commands are given a chapter to themselves.

This book is very simple to follow and written in a style which is very easily understood. A recommended read for anyone contemplating buying the program.





The Amiga Handbook
David Lawrence and Mark England
Sunshine Books
£7.95

The whole publishing world seems to be full of general books about computers or computer systems. This book is a bit of an exception purely because most people are curious about the Amiga's new and innovative range of capabilities. So complex is the beast that after describing the system overview, there is very little room left in the book for programming examples. After reading the book you end up feeling that you've only shaken hands with the machine rather than having gained an intimate knowledge.

This book should prove invaluable to anyone thinking of splashing out on the new machine. It will also be a companion in the first few months of use but eventually it will outlive its usefulness as the system becomes more familiar.

Gadgets, icons, the Blitter, Intuition and all the other mysteries of the machine are cleary explained in layman's terms. The actual harnessing of the Amiga's power is not dealt with in great detail.

I found the description of the internal chips of the Amiga a little offputting in its position at the beginning of the book. A more general introduction would have given a less daunting approach to the non-technically minded reader. Although I admit that the text makes things crystal clear, I must also admit that it is difficult to cloud a shallow pool.

A recommended read for those contemplating a spending spree but an Amiga owner would look for something more meaty.

The Anatomy of the 1571 Disk Drive
Rainer Ellinger
First Publishing
£12.95
0-948015-801

FIRST PUBLISHING REALLY HAS GOT its act together when it comes to publishing detailed documentation on Commodore products. In this offering over half of the book is given over to a complete disassembly of the 1570/71 ROM and the rest of the book is a detailed instruction manual.

The first section of the book explains about setting up the drive and formatting diskettes. This is followed by explanations of the simpler commands in Basic 7.0.

Each command description is preceded by a clearly laid out table in bold characters. Here the command is shown in four forms: the current 7.0 style, the abbreviation for it, the old style command used before Basic 3.0 came along, and the command as it used from the Monitor. Beneath this table is an explanation of the use of the command and any points which are essential to the user. Sensibly, this section carries the essential warning about the save and replace command which does not appear to have been improved since the old PET days. NEVER use @!

Advanced disk commands are dealt with in a similar no nonsense way. This points out the senseless implementation of the BACKUP command which has no earthly use for 99.9% of C128 users.

Sequential and relative files are covered with varying degrees of success. The section on sequential filing is excellent but relative files are dealt with in a sketchy manner. This is no real fault with the book, it's just that the concept of relative file creation is too complex to be dealt with in the short space available within the book. Perhaps we can look forward to a definitive work on the subject in the near future.

The rest of the book is of interest to advanced programmer's only. The block access commands are investigated in sufficient depth, allowing the adventurous programmer to try them out. CP/M formats are described along with the range of formats which the 1571 will recognise.

The GCR coding used by the disk system to store information is fully detailed, including how the sync marks are used to tell the disk drive where it is to start reading from.

For the price of this book you get a wealth of knowledge which is a must to the serious programmer and a sound investment for a novice who wishes to scale the heights of professionalism. Much of the ROM disassembly is of no real use to the majority of programmers but holds a strange fascination for buffs such as myself.

I hate books which purport to being the 'only book you'll ever need' and this book lays no such claim. In this case I feel moved to make the claim for them: for the majority of users this is THE definitive work.

Children at Risk
David Porter
Kingsway Publications
£4.95
0-86065-374-9

DAVID PORTER HAS BEEN INVOLVED with computers for many years but his main concern at the moment is the welfare of children in today's high tech world.

Children at Risk looks at all the pressures to which a child is subjected and the areas of Porter's concern seem principally to be media related. Apart from the final chapters on child abuse and drug addiction, the book concerns itself with video and film, role-playing games, comics and computers.

From the outset Porter makes the reader aware of his Christian beliefs which will alienate potential readers who are agnostics or atheists. Does Porter think that Christians care more about their children than non-Christians? I hope not, but why limit the audience by indirectly insulting the Moslems, Sikhs, Jews and various other concerned groups by giving the book such a heavily religious slant?

Part of the answer to this criticism is that the book is published by a staunchly Christian publishing house. Personally, I feel this is a pity because such views undoubtedly deserve a wider airing.

Very little attention has been drawn to the harm which computer games may be having on today's child and the question which must be posed is how divorced from reality are games?

The elimination of wave after wave of aliens is not Porter's concern, no doubt he played war games or cowboys and indians in his own childhood and still grew up to be a well adjusted adult. He sees part of the threat in Adventure games which delve into the depths of satanism and Black Magic. More importantly, in my opinion, he names the main evils as piracy and hacking.

Piracy is the bane of the computer industry and yet no effective legislation exists to prevent schoolchildren up and down the country from breaking the law each day. Porter implies that this puts the child on the wrong tracks and who knows where this may lead?

Many cases of children being accused and convicted of breaking into personal files and private systems via modem-linked hacking have been given news coverage lately. Surely this is akin to breaking and entering?

Porter has got many strong arguments to put forward in each section of the book but I'm still left with the feeling that the author sees bogeymen lurking in everything new, hiding behind the benefits. In aligning himself with Mary Whitehouse he sets up his stall from the dedication page, by the middle of the book I was suffering from Bible-bashing fatigue but by the end I was more thoughtful.

Porter is a persuasive man who deserves an audience but, like medicine, it may leave a bad taste in your mouth.

Interestingly, the book is being promoted by Dave Carlos of Solutions PR company. Is this a penance for being involved with Domark's Friday the 13th promotion which used a sickeningly gory mask in its banned advertising campaign?

Getting The Most From Your Printer
J W Penfold
Bernard Babani
£2.95
0-85934-155-0

TO ENCAPSULATE ALL YOU WANT TO know about a printer in a mere 84 pages is a challenge, to say the least. When this involves all the popular makes of computer, the task appears impossible. Undaunted by the problems, Penfold takes a brave stab at the subject and almost succeeds.

The author's main concession is to limit the text to the use of Epson dot matrix printers. It would have been better to mention this fact on the back of the book for those who have printers which are not Epson compatible.

Compared to most of the material available on this subject (almost exclusively manufacturers' manuals), this is a useful guide to some of the most desirable facilities which these printers provide.

Although the book waxes lyrical about the various typefaces, pitches, underlining, spacings, tab settings and the like, it omits to mention the thorny subject of user defined characters. Penfold's obvious aim is to stick to the normal printing functions of a matrix machine and this is borne out by the section on wordprocessors.

The commands used are written in various Basics: Commodore, MSX, Spectrum, QL, Acorn, Amstrad, Memotech and the ill-fated Enterprise. If the book was thicker or if the range of machines more limited, there would have been room to include much more information. Still we must allow publishers plenty of room to make their profits.

What we are left with is a very useful guide for newcomers to Epson compatibles or for those users who rely on an interface to control straight-forward printing and leave the clever stuff to the big boys.

An Introduction To Computer Communications
R A Penfold
Bernard Babani
£2.95
0-85934-151-8

IF COMMS SOUND LIKE THE THINGS your grandfather wore in the cold weather, or if baud rate suggests the speed at which ennui sets it when watching yet another tedious Australian 'soap', then I strongly recommend this thin volume to you.

All of the buzzwords are here: modems, stop bits, parity and duplex. As each word is encountered a full explanation is given which reveals the subject as a simple core shrouded in thick veils of jargon.

Penfold does not stop here, the book also delves into what you can (politely) do with your modem and stretches the subject into direct communication between computers and radio communications.

The section on direction connection (local networks) is especially interesting to Commodore owners because the mystery of the non-standard RS-232 (the user port) is explained at length. Later in the book some simple program listings are given for direct communications between Vic 20s and C64s.

For a mere £3 all this is remarkable value.

Commodore's Handbook of Simons' Basic
Jane G Reh
Brady Communications Co. Inc.
(Prentice Hall Publishing Co.)
£11.25

EVERY COMMODORE OWNER HAS heard of Simons' Basic (S.B.). If you have never become acquainted with S.B. then this is the book for you. Indeed, even if you are conversant with S.B., you may yet find some surprises here.

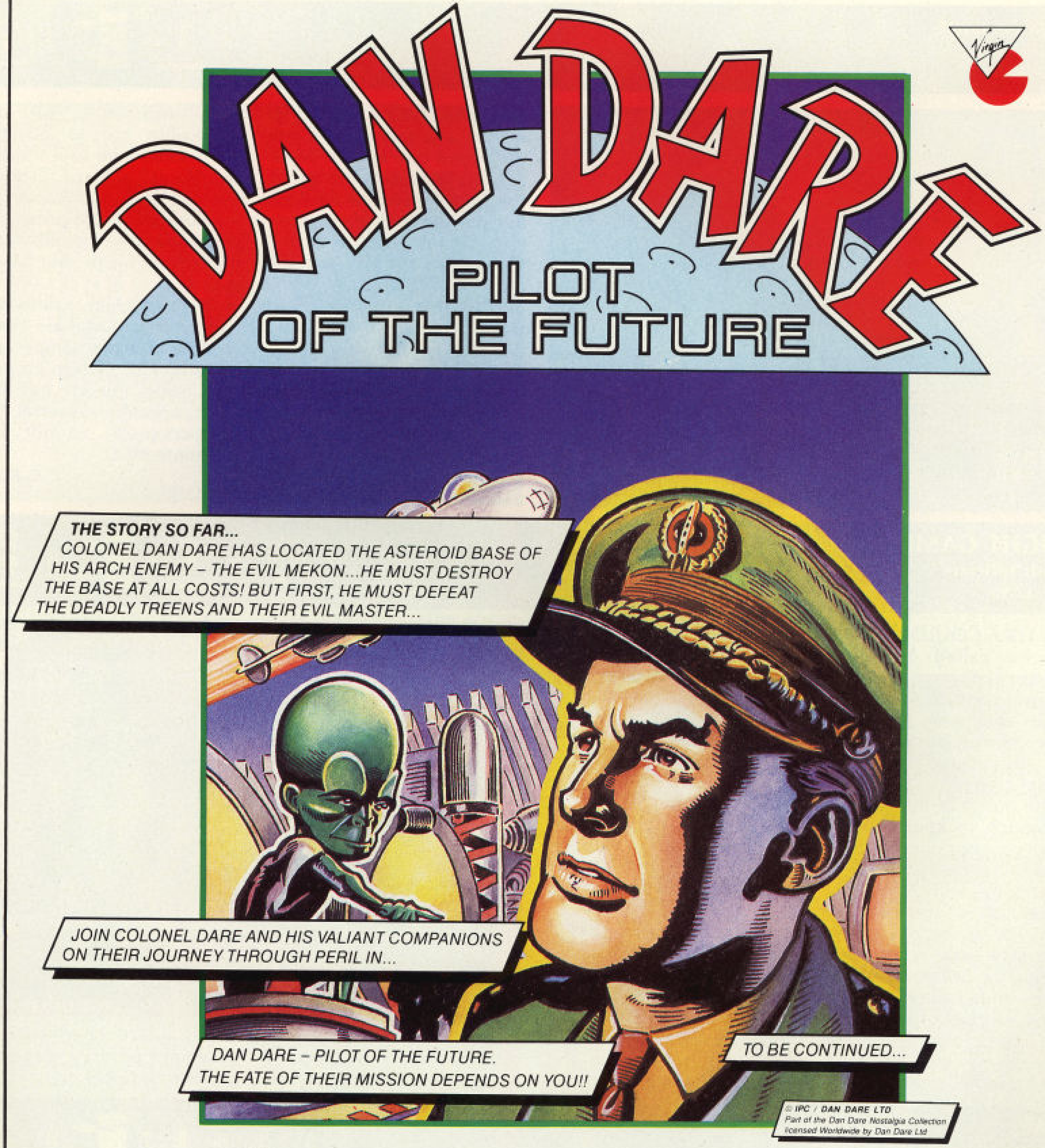
Jane Reh has compiled a very comprehensive survey of S.B. which clarifies the original manual very efficiently. It would be hard to get frustrated with this book as all commands are well defined in some 22 different sections, which cover almost everything you need to know. In addition there are plenty of sub-sections and a fine collection of illustrative programs. So if you really want to get to grips with S.B., this is the book for you.

David Simons has had the good sense to 'extend' his programs and offers some streamlined ideas for you to try out. An interesting chapter on new methods of Data Handling is introduced involving 'local' and 'global' variables, while structured Programming gives four new commands: PROC, END PROC, CALL, EXEC. These commands simplify programming tasks and could lead you into business programming in a modest way – A 'touch of Pascal' to quote the author. Perhaps so, but you will have to work on this one yourself to make full use of the commands.

Naturally everyone's concept of S.B. is as a graphics program. This is fully clarified here and the creation and use of sprites is happily dealt with – ideas a'plenty here.

Sound and Music are adequately covered and the read functions for Joystick, Paddle and Lightpen discussed. The author does not seem too happy with these – quite rightly too!!

I am happy to note that, in his foreword, David Simons gives full credit to Jane Reh for the compilation of the book. Good luck to both of them and to you when you use it as it is an enjoyable, well presented, well documented book which is good value for money. **E.M.**



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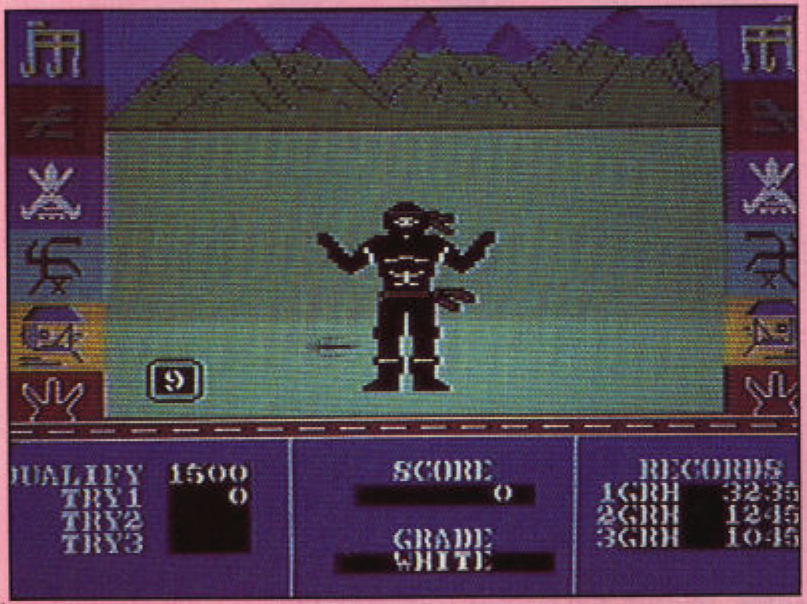
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Ninja Master

Firebird
C64 £1.99

Originality 3 · Playability 4 · Graphics 5 · Value For Money 3



YET ANOTHER ORIENTAL martial arts game and a not very good one at that. Ninja Master sees you attempt to rise from the rank of absolute beginner by qualifying in four tests. Do this and you can try them again at a harder level etc. etc.

The first task sees you trying to fend off arrows as they are fired at your body, using four keys – one for each limb. Secondly you have to karate chop a lump of wood. You have 20 seconds to hammer the keys and reach a sufficient power level. This element of the game is far too easy and it is almost impossible not to qualify. Then some kind soul throws shurikens at you. These pointed stars, aimed high, medium or low and coming at you at a variety of speeds must be deflected with your trusty sword.

The graphics, although large and colourful are fairly crude and are accompanied by various far eastern grunts. The game though has no lasting appeal, and even at the budget price, cannot be recommended.

G.R.H.

KNIGHT GAMES

English Software
C64 £7.95

Originality 7 · Playability 9 · Graphics 8 · Value For Money 8

THIS TITLE COULD JUST AS well be called Ye Olde Summery Gaymes. Eight medieval combats for you to try. Six against an adversary (either human or computer) and two dexterity based archery contests.

The object of the game is very much to knock lumps ouit of your opponent before he does likewise to you. Each player starts with 10 shields and each shield consists of 10 roses. A successful hack removes a rose from your adversary's total and the game ends when either player runs out of shields or time runs out – nicely depicted by wax dripping from a candle.

The combat sports are two sword fights, quarterstaff, pikestaff, a battle axe and – my favourite – the ball and chain – a sort of conkers for grown ups! For each event, you have four aggressive and four defensive manoeuvres available to you as well as moving left and right. You can also try shooting wooden horses with the long bow and moving targets with the cross bow.

The whole game is very nicely animated with some excellent backdrops and some appropriate music although I preferred to turn this off and listen to the sound of weapon against bone. The game is on a multi load tape

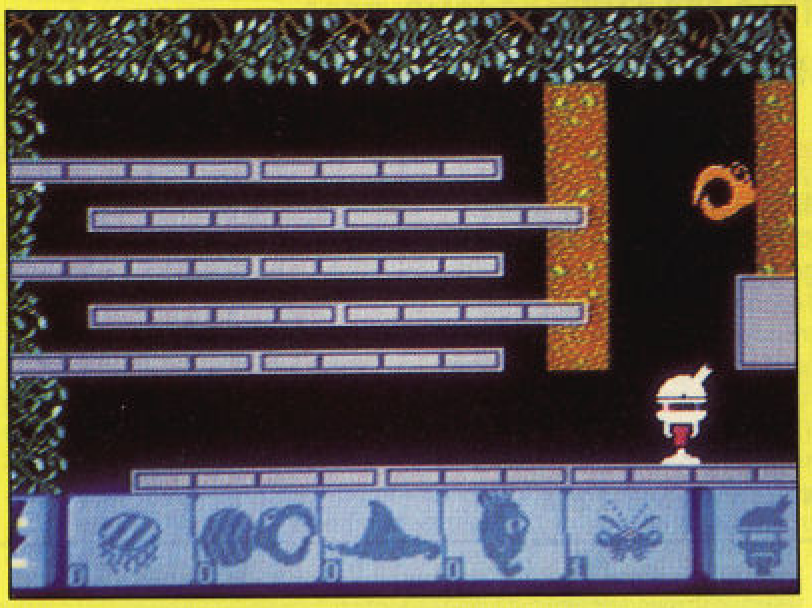


and for once, I had no problems with it whatsoever. A highly enjoyable game to play with the added advantage of being very well presented. **G.R.H.**

ARAC

Addictive Games
C64

Originality 8 · Playability 6 · Graphics 7 · Value For Money 8



ARAC IS A DROID AND AS such has only a limited range of actions. He can move left and right, jump and fire a net. But, if he can find two extra legs and the power globe, he can transform into Arachnidroid with the ability to fall upwards and fire energy bolts.

Only in that form can he hope to deactivate the three reactors. Even then, he might need a little help from his friends.

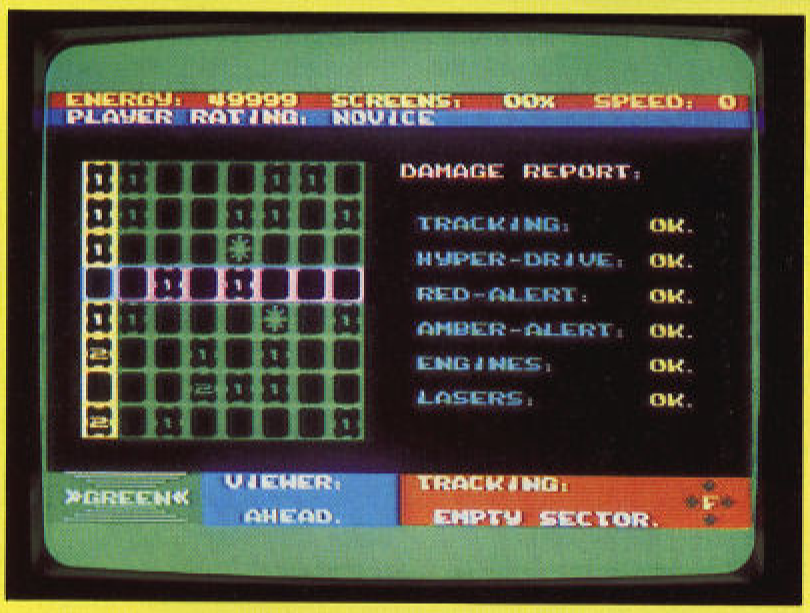
Assorted creatures inhabit the complex and by firing his net at the right moment, Arac can capture them. These creatures can then be summoned at a later date to help Arac in exchange for their freedom. Rays will black out the radar systems, Borers can eat through solid wall, stingers can give you extra high jumps whilst rock hoppers will help you open the fish when you find it. You can hold up to eight of each type in your cage and activate them by accessing an icon screen.

The game must be completed within a time limit but ends sooner if your energy runs out.

G.R.H.

PROJECT NOVA
Gremlin
C-16

Originality	Playability	Graphics	Value For Money
6	8	9	8



FOR PROJECT NOVA READ Startrek. If this means nothing to you then this game is modelled on one of the golden oldies of the computer world.

The galaxy has been attacked by an alien force and they have already taken over many sectors of your space map. By hyperspacing to their locations you must defeat them all in battle and free the galaxy.

To help you, you have two laser cannon and a tristate set of shields – green, amber and red. Green is a defenceless state, enter combat in this state you won't last long. Amber is suitable for a single opponent but red will be needed for serious battle.

Using your on-board computer you are given a display showing the galaxy grip map which indicates the number of ships in each sector. Selecting a destination using two intersecting coloured bars you zoom off through a tremendously effective 3D space warp to face the foe.

As you do battle damage occurs and you have to repair your ship quickly or run for it. Everything you do takes energy and this can be repleated by resting in a cleared zone or by hyper-spacing to an energy square on the map.

As you gradually mop up the empire your command rating goes up towards Legendary, the highest status in the universe.

Gremlin really seems to have come to terms with the C-16, the action seeming very realistic indeed. Excitement and a little planning make this an excellent game.

E.D.

FRANK BRUNO'S BOXING
Elite
C-16

Originality	Playability	Graphics	Value For Money
9	9	9	9





AMBITIOUS BUT SUCCESS-ful is the way I'd describe this boxing simulation. Personally I'm not a fan of the pugilistic pastime but a computer version is bloodless and bruiseless so it's OK by me.

The graphics are really outstanding with the view of the ring showing Bruno's back as he faces his opponent. The punches and feints are controlled by keyboard presses but these are not re-definable so hard luck if you don't like them. This method of control is complex and could have been simplified if the function keys had been used.

Bruno's opponents are loaded individually from tape but you must beat each one to progress to the next. This is because there is an entry code awarded but once you know the code you can skip the defeated contenders in future sessions.

The three opponents on the tape are Canadian Crusher, Fling Long Chop and Andra Puncheredov in order of difficulty. Each has his own characteristic style and you must beat them at Light, Middle and Heavyweight before you get the code for the next fighter. Each fight lasts three minutes and you must knock the other guy down three times to win.

The screen display shows the opponents cartoon faces in the opposite top corners but the interesting details fill the space between. These details show the status of your opponent, your own status and elapsed time.

Every C-16 collection should include this game, it's a knockout!

E.D.

BOMB JACK
Elite
C-16

8 3 2 3



I WONDER IF ELITE'S HANDS were tied by Tehkan the makers of the original Bomb Jack arcade machine? I only ask because the backdrop seems to cause more attribute problems than its worth. For most of the game poor jack seems to be flying about with a box around him. Although the Sphinx with her inscrutible smile does make an interesting scene, it detracts from the quality of the gameplay.

Around the sphinx screen are a number of ledges with bombs resting on them. The upper ledges are patrolled by little men and a giant bird, insect or something flies between the ledges in pursuit of Jack.

The little men gradually get tired of patrolling the same old ledge and drop to progressively lower ledges until they reach the bottom of the screen. Here they mutate into large black balls which float around the screen adding to Jack's problems.

Bonus disks are supposed to appear but I've yet to see any.

This game could have been the best C16 game on the market but the confused screen rates it much lower.
E.D.

HERCULES
Alpha-Omega
C64 £1.99

4 4 3 7

A STRANGE LITTLE PLATform game with poor graphics and sound together with a lousy choice of colour schemes does not immediately appear to have a lot going for it. But for some reason, Hercules is strangely addictive. You control the Greek Hero as he tries to solve the 12 labours set him by King Eurystheus.

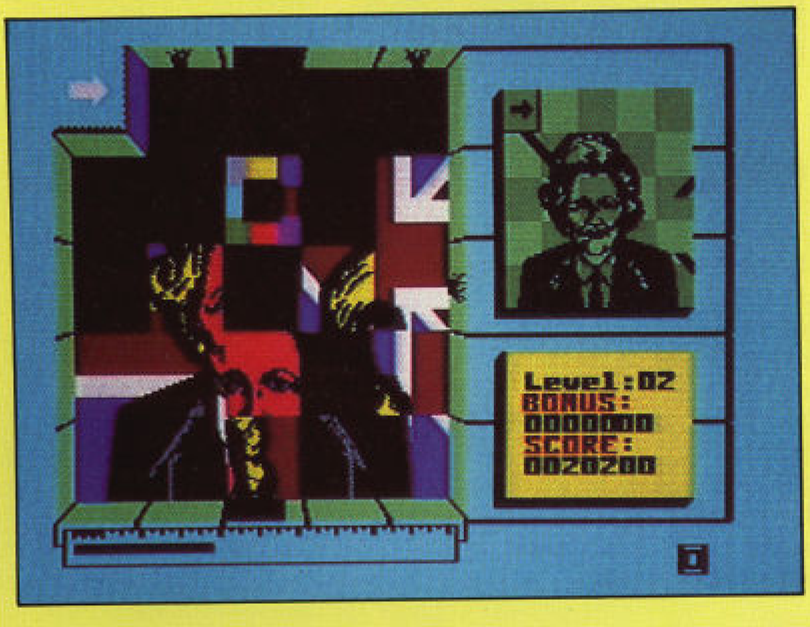
Each labour consists of two or more associated screens and herein lies the problem. You have very little idea of what you are supposed to be doing. Frequently, large areas of the screen appear blank and you must leap into the unknown hoping that a platform will miraculously appear underneath you. There are ropes to be climbed, platforms that collapse under you and assorted nasties to be avoided. Everything that you do though must be done quickly. Platforms under you quickly burst into flames and there is also a time limit on most screens.

Hercules needs a lot of experimentation if you are to get anywhere and this seems to put a lot of people off the game. Certainly, a straw poll in the office resulted in a 50/50 split of those who loved it or loathed it.
G.R.H.



SPLIT PERSONALITIES
Domark
C64

8 7 7 8



BASED ON THE OLD sliding block puzzles in which you move pieces of a picture round a board attempting to reconstruct the original, Split Personalities is a highly original variation on a theme in which the likes of Ronnie, Maggie and Sir Clive hopefully appear before your very eyes.

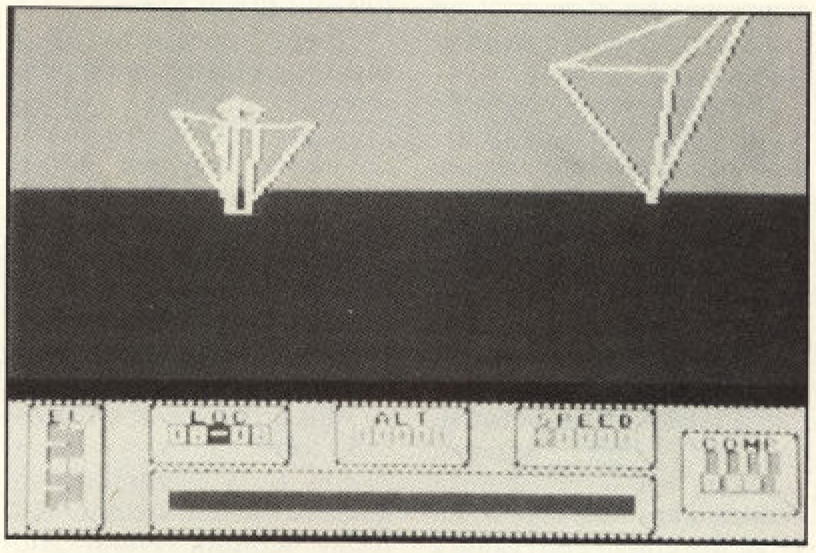
The first difference that you notice is that the board starts off empty. You bring on pieces as and when you want them. Pieces continue to slide until they either hit a wall or another block. Gaps periodically appear in some of the walls allowing you to return unwanted bits of puzzle to the stockpile.

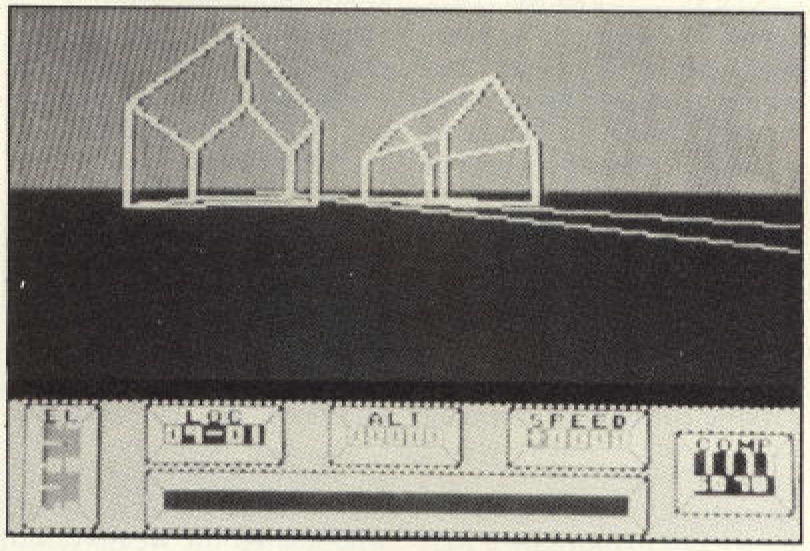
Each screen must be completed against the clock. A nice touch is that there is a small completed picture highlighting exactly where your current piece should go. Control is straightforward but I didn't feel that the game was as responsive to my touch as it might have been. Nevertheless, an original and highly entertaining game to play.
G.R.H.

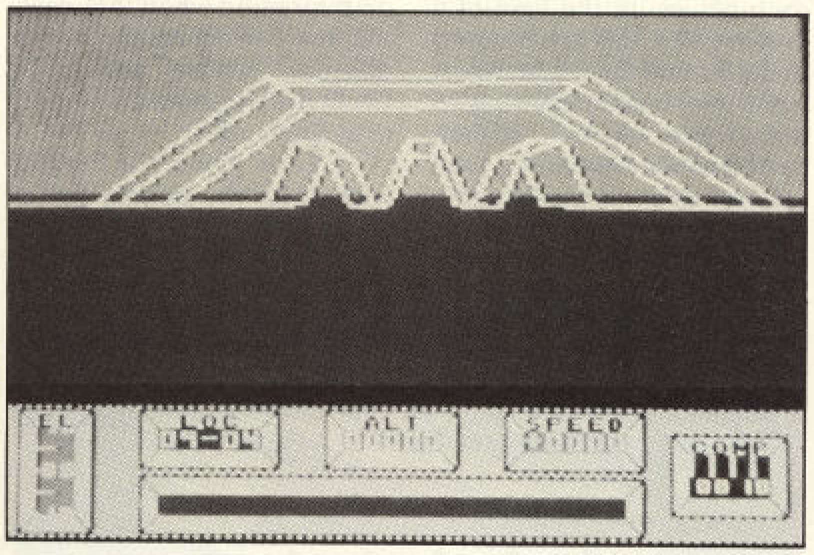
MERCENARY – THE SECOND CITY

Novagen
C64 + Joystick

Originality 9 · Playability 8 · Graphics 10 · Value For Money 9







REMEMBER MERCENARY? If you don't then rush out and but it immediately so that you can try the Second City. If you do dash out and buy this data disk.

Back already? OK. Mercenary is Novagen's tour de force. In the first game you had crash landed in the middle of a civil war on the planet Targ but the Palyars and Mechanoids are still going at it hammer and tongs.

Again you must decide whose side your on but your decision is totally arbitrary because all your interested in is the cash which will buy you your escape.

In Mercenary you were battling above and below Central City but now you find yourself in the deep south in the grip of a long, long winter. The Palyar Commander's brother-in-law is the prison governor here and he has his beady eye on you from the start.

As in the first game you have to buy your first ship on the planet. Although the price is still the same, other commodities are more expensive than they used to be.

The graphics in this game is up to the high standard of Mercenary. For those who haven't seen it, Targ is shown in wire frame 3D style, like Elite. Unlike Elite, the graphics move very quickly as you skim the planet's surface in your search for an elevator. Along the way you can marvel at the architectural delights of Targ, created by Walton, the planet's greatest architect. Philistines with itchy trigger fingers can fire a volley or two at some of these buildings but be warned, the Targian's won't take such disrespect lying down.

The 3D effects are tremendous and your not limited to merely skipping along the ground. If you turn upwards to 90 degrees your ship will zoom heavenward where you can stop and look back to see the city. There, far below, you can see the streets laid out in a grid which you can draw before zooming back down to the surface for a soft landing.

When you bought your ship, the Palyars sent a message stating the location of one of their lifts. On reaching the correct place you may descend into the subterranean city.

Your next task is to find the briefing room which is an easier task than in Centraal City, but finding useful objects is harder. The Mechanoids briefing room is around here as well so you can easily decide who's side you're on.

Access to the Mechanoid's hideout is not easy. The briefing room only has those strange triangular doors which, we are told, lead to the author's cheat rooms. These are locked and only he has the key.

The game now follows a maze game pattern but beware, the dirty tricks brigade have set traps. One which I found very quickly was the entrance to the prison. This is a total dead end. When you turn around after entering the door has disappeared and the only option appears to be quitting from the game, or is it?

Quitting does not mean ending the game, as you may think. You reappear on the planets surface in a vehicle but without any of the useful objects which you may have picked up underground. Once more you have to find the lift. What do you mean, you've forgotten the location? Nothing left but to systematically search for another lift.

Second City is for those who really enjoyed the first game. It is not so very different in style to its predecessor. The wire framed buildings are still the same and the markings on the doors have not changed in meaning. It is, however, much harder to succeed.

Some humorous touches take the form of billboards. One with the Commodore logo, another with the Atari logo and a third with the name of one of the author's previous creations. Hitting the CBM logo gives the same 'traitor' response as before and blasting the Atari sign will bring congratulations. Don't go for the third sign though, it will bring the author's curse down around your ears. Things are going to get harder is the threat, so be warned.

E.D.

MIND PURSUIT

US Gold
£14.95
C64

Originality 8 · Playability 6 · Graphics 6 · Value For Money 7

GENERAL KNOWLEDGE games are enjoying a great deal of interest at the moment, thanks to the way Trivial Pursuit has grabbed popular attention. Mind Pursuit bases its style on the original concept of categorised questions but translates the board game into a suitable form for the computer medium.

The board is replaced by a snaking pathway of stepping stones which each player must negotiate. Each correctly answered question allows you to move on a step or two depending on the difficulty level and at several points you are given the opportunity to choose a short cut of difficult questions or continue on your way with softer options.

The point values of the squares are 25, 50 and 100. For 25 points you simply have to say if a statement is true or false. Fifty points are awarded if you answer a question correctly from a menu of four optional responses. To gain 100 points you have to type in your own answer to a question.

The high scoring option has a pitfall. Even though it allows you to omit a letter to get one letter wrong, the answer still has to be substantially the same as the one given. For example, 'boy scouts' is a correct response to a question but 'scouts' would be deemed incorrect. Although some of my fellow players moaned like crazy about this, I thought it was a valud attitude. In my time I've played against question masters who have applied the same rule in the board game.

After Monster Trivia I was set to complain bitterly about the American bias of the questions but not now. The sport questions are very American but if these are treated as 'stinkers' the majority of the other questions are fair enough. Only one question really annoyed me and that was 'In the popular nursery rhyme, who chased the weasel?' (no the answer isn't 'pop').

I don't know if there are plans to release extra question databases for the game but I hope so. There is no facility for building up your own questions and I found that many of the questions were repeated during a second playing of the game. On two occasions in a game the same question occurred twice.

Some of the questions use graphics or music which is a good example of using the computer's capabilities to the full.

Each player in turn presses a key to stop a running number generator. The value given selects the area on which the question will be asked. The six categories are: sports and games, science and nature, history and geography, TV and film or culture. Throwing a six gives you a general knowledge Grab Bag question which gives you the chance of an extra turn if you answer it correctly.

The game is only available on disk and each side of the disk has questions ranging from simple to extremely difficult, A limit can be set on the response time, a score limit can be set or an overall time limit. The adds variety to the game, it's just a pity that the response time can't be set for individual players to handicap those irritating know alls that I always seem to be pitted against!

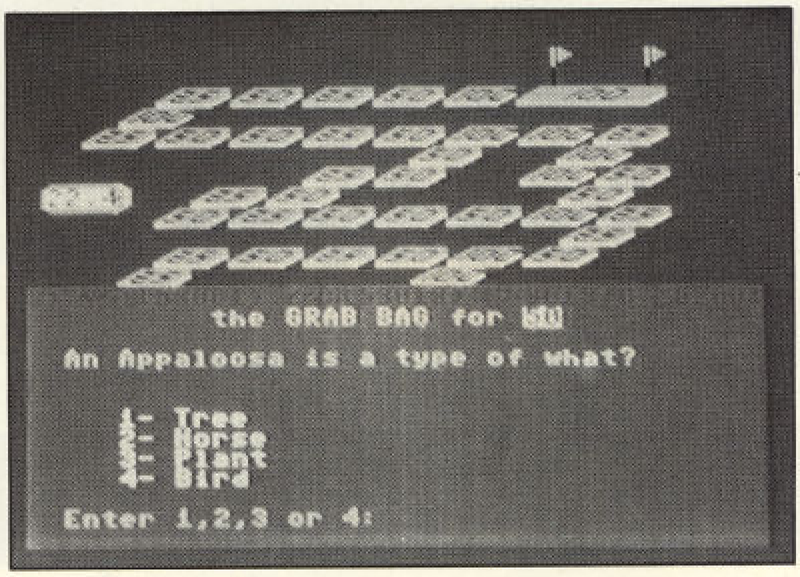
At the end of each game a scoreboard is presented which shows the percentage of correct responses given by each player. In the case of a drawn game this can be used to determine the victor. Apart from this, it is interesting to see how your overall performance measures and means that a one player game can be just as much fun as the full four player game.

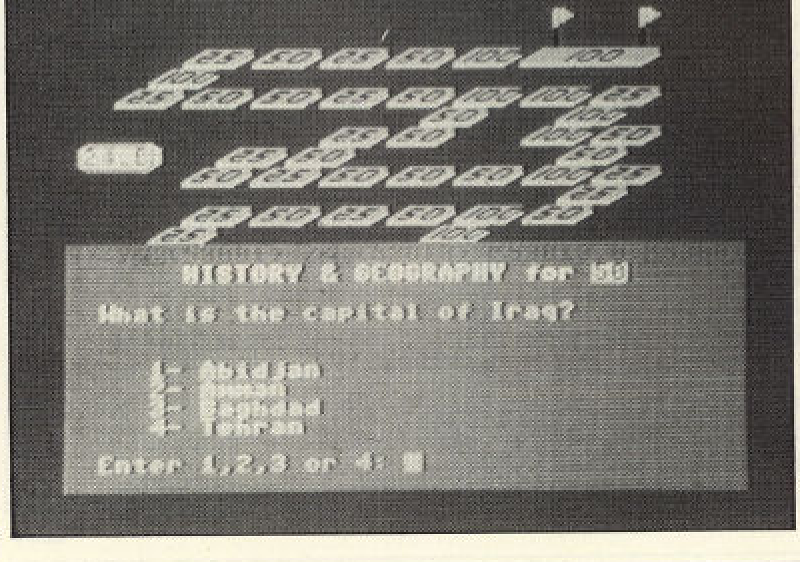
There appears to be a slight problem with the screen display which probably results from the difference between British and American mains supplies. The screen is split using an interrupt and the line between the board and the question area flickers a row of characters in an extremely irritating way.

The problems of syntactically correct answers is offset slightly by a comprehensive guide in the instructions. As a result Scottish, Welsh and Northern Irish players will probably turn up on US Gold's doorstep with murder on their mind when they read that the correct response to a question whose answer is Great Britain should be typed in as England!

A good game but I'm still waiting for the perfect Trivia.

E.D.



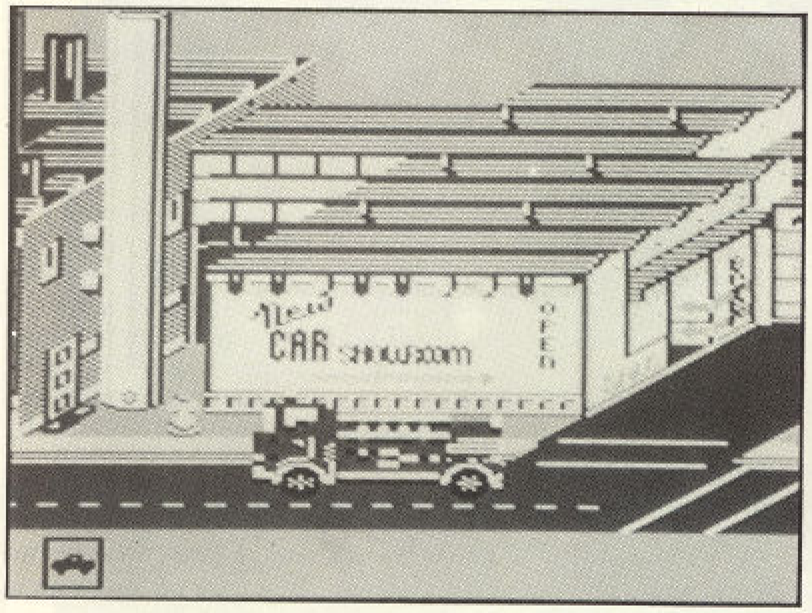


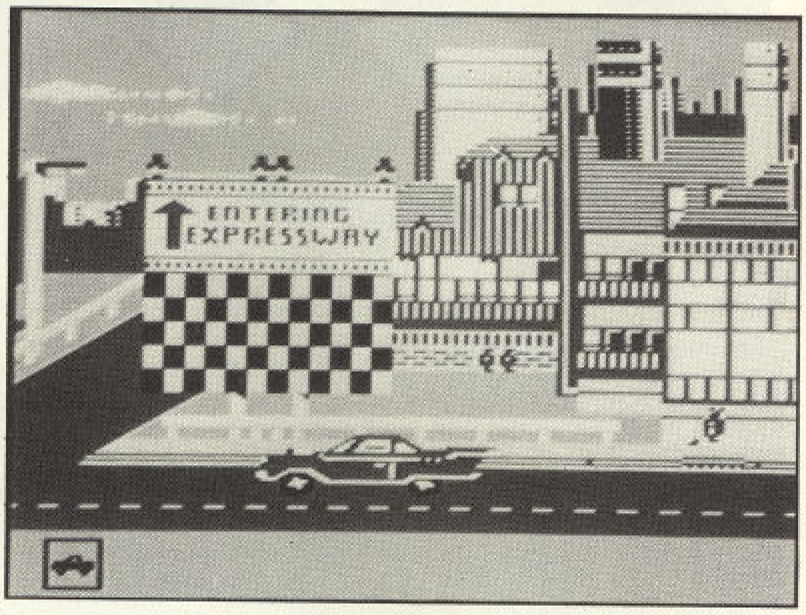


HOT WHEELS

US Gold
£14.95
C64 + joystick

Originality 6 · Playability 3 · Graphics 5 · Value For Money 4





HOT WHEELS IS BASED ON Mattel's toy cars of the same name and is aimed at the littlies. It represents a new concept called Computer Activity Toys imported by US Gold from America's excellent Epyx company (Summer Games, Impossible Mission, etc).

To say that this is a brilliant game would be like saying that the Sun is a newspaper. The programming standard is as high as usual but the gameplay which results from all this effort does not go far enough.

At the start of the game you have to select your car from the showroom or build it yourself in the factory. The showroom cars resemble the Hot Wheels range but the DIY cars are created by selecting a front, middle and rear section from the range available in the workshops.

In both cases the overall colour of the car has to be selected in the paint shop. The car is then sprayed with clouds of colour and the car is ready for the road.

Next you find yourself outside the car salesroom waiting to hit the road. As you travel around there are several options for you to choose from: you can go for a carwash or park in a multistorey carpark and change your car again. The only really interesting part is the demolition derby stadium. After the fuss about choosing a car colour I was disappointed to find that the demolition car is always red.

The action is seen in plan view with the four cars represented by coloured blocks. As the cars bump into one another gradually become mis-shapen until they turn into grey wrecks. At any point you can leave the stadium and return to normal life in your old car.

With nothing much to do in this part of town, you'll soon be itching to whizz along the expressway and investigate the other part of town. This trip is done in automatic gear. In other words you sit and watch as the car does its own thing, eventually reaching the other location (why's the car on the wrong side of the road, daddy?).

In this part of town you can top up your petrol, change oil, tune the engine or swap your car for a shiny, red fire engine. These activities provide a bit of fun to the game especially catching the dripping oil which seems to drain from all over the car body.

More could have been made of this section. Why is the price of the petrol shown but not used as part of the game? Surely it would be more fun to earn money at the demolition derby and spend it on the services in this part of town? Running out of petrol and badly running engines could have made this much more entertaining and would give greater purpose to the game.

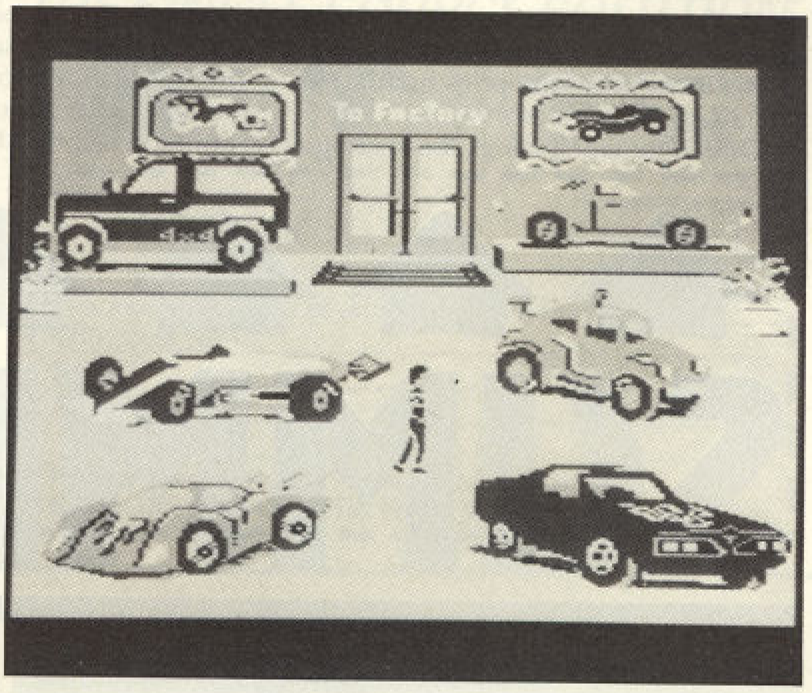
On the good side, tuning the engine and operating the fire engine takes a bit of thought.

To tune each piston you have to use your eyes and ears. The performance of each piston in turn is represented by a sine wave and a sound. An ideal curve and sound is given as a reference and the idea is to match the current piston's performance to this. After each piston is set the two waveforms are compared and success gives a green light display.

One of the houses has a habit of bursting into flames and the race is on to collect the fire engine and dowse the flames before the house burns down. Changing from your current car means parking it in the fire station garage with its up and over doors. Then the fire engine can emerge from its garage and dash off to the conflagration.

On arrival at the fire, the water tank is shown and the idea is to dowse the flames in each window before the water runs out. Fail in your task and the house burns down before your very eyes.

This could have been a superb entertainment if just a little more thought had been put into it. As it stands it provides short lived entertainment and I was left with the feeling that playing with the actual toys would have greater appeal to most children. **E.D.**



SUMMING UP

Gordon Hamlett explains how Ariolasoft can help you balance your books.

WHENEVER SOFTWARE GETS bundled with a computer, it is a pretty good bet that the three packages included will be a word processor, a database and a spreadsheet. The first two are familiar terms to most home micro users, but by and large, spread sheets have always been associated with businesses.

If you ask a non user what a spread sheet is, a typical response might be "something to do with accounts or financial forecasting". Is it reasonable to assume that this tool too will find a place in the home, and if so, what will people use it for? *Cal-Kit* from Ariolasoft aims to be useful to home users and there are some 20 initial ideas as to how it might prove helpful.

A spreadsheet is really no more than a very large sheet of paper divided up into rows and columns. It allows you to make calculations on a given set of figures, for example your household expenses, and then re-calculate things quickly and simply without the need to rewrite the whole thing if, say, the mortgage rate changes. It can be used for nothing grander than checking your bank balance or working out how many rolls of wallpaper you need to decorate the lounge or, on a higher level, managing your company's finances. One term often associated with spreadsheets is "what if?" This is because it is easy to work out problems such as "What if I increase the price by 10% but lose 3% of my sales as a result?".

One of the worst things about using a program like this is if you load it in and are presented with a series of rows and columns and you have absolutely no idea what to do next. It is here that Cal-Kit comes into its own. Not only do you get an easy to follow tutorial in the instruction manual, but you also get 20 previously designed forms, all of which come in two formats. The first has sample figures already loaded in to show you the sort of results to expect and the second is left blank for you to use your own figures. If the design of the form is not quite to your liking, the tutorial shows you how you can easily change it. For example, you might not have a car and so have no use for a row giving details of motor expenses but prefer to substitute it for itemising your children's school fees.

It is these templates that make the package easy to use and I for one would not have bothered setting up my own sheets if I had nothing to go on. Amongst the templates included are:- home budget, metric conversion, starting a business and calculating loan repayments.

So how does it all work? As I have mentioned, the sheet is divided up into a series of rows and columns. In Cal-Kit, the maximum size of the sheet is 26 columns (A-Z) by 99 rows (1-99). By referring to its co-ordinates, you can easily address any particular cell e.g. C34 or K4 etc. The content of each cell can be text, numeric or formula. An example taken from the home budget template will show how it all fits together.

In the first column, you write down details of the varioius items of income and expenditure – salary, rent, travel etc. These are all text cells as are the labels for the text 12 columns – January, February etc. In the appropriate cell, you enter the relevant amount. For example, if cell B2 represents salary for January and you earned £500, you enter 500 in cell B2. This would be a numerical cell. If all your outgoings for January were in cells B20 through to B30 and you wanted to know your total expenses, you get the program to total cells B20 to B30 and to put the result in B32. This is an example of a formula cell. Having input all your figures, you can quickly get answers for your nett income or see how much you are spending on beer on a month by month breakdown.

The program itself is very easy to use. A help screen is always available if you need it and there are several facilities designed to make life as simple for you as possible. A typical example is the replicate command. Say you have just entered a formula to add up all the expenses for January and want to do the same for the rest of the year, a simple command allows you to copy the formula across without having to write it out a dozen times. Sheets can be loaded from and saved to disk and be printed out if required. If you use Paperclip word processor, you can integrate the sheet into a report or a begging letter to your bank manager.

The acid question is, I suppose, would I use it myself and the answer is probably yes. The hesitancy is not through any fault of the program, I would recommend that without hesitation to anyone who has a lot of figurework problems. It is just that I can't come to terms with the fact that my days are numbered!

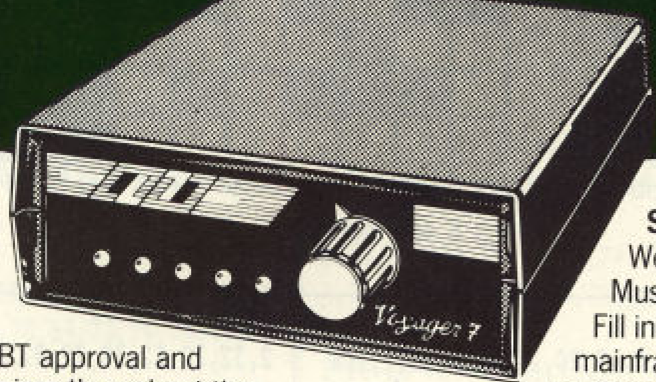
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SUMMING UP

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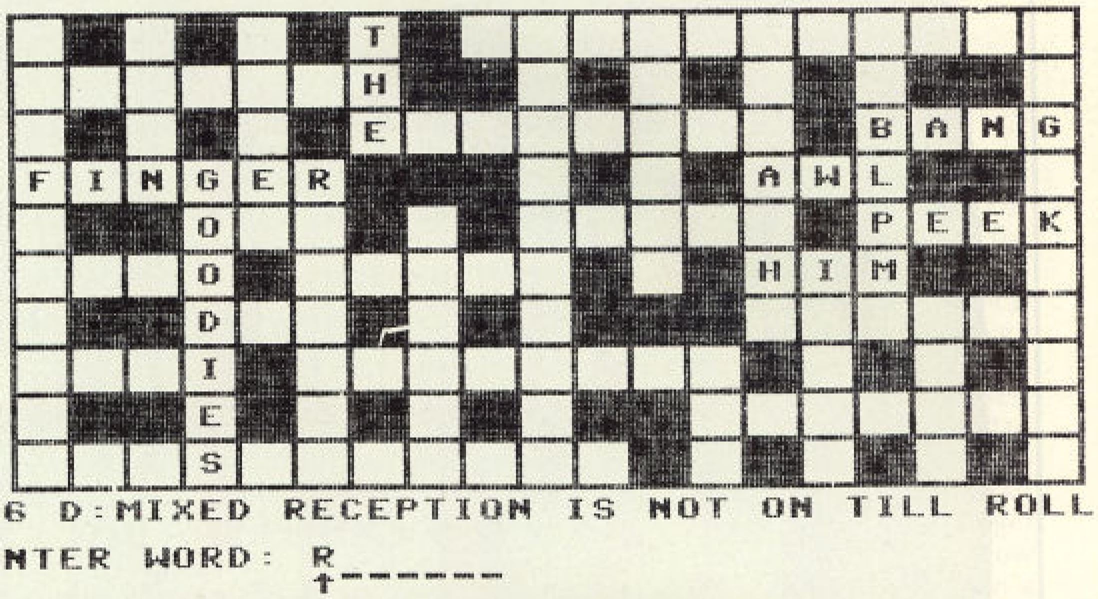
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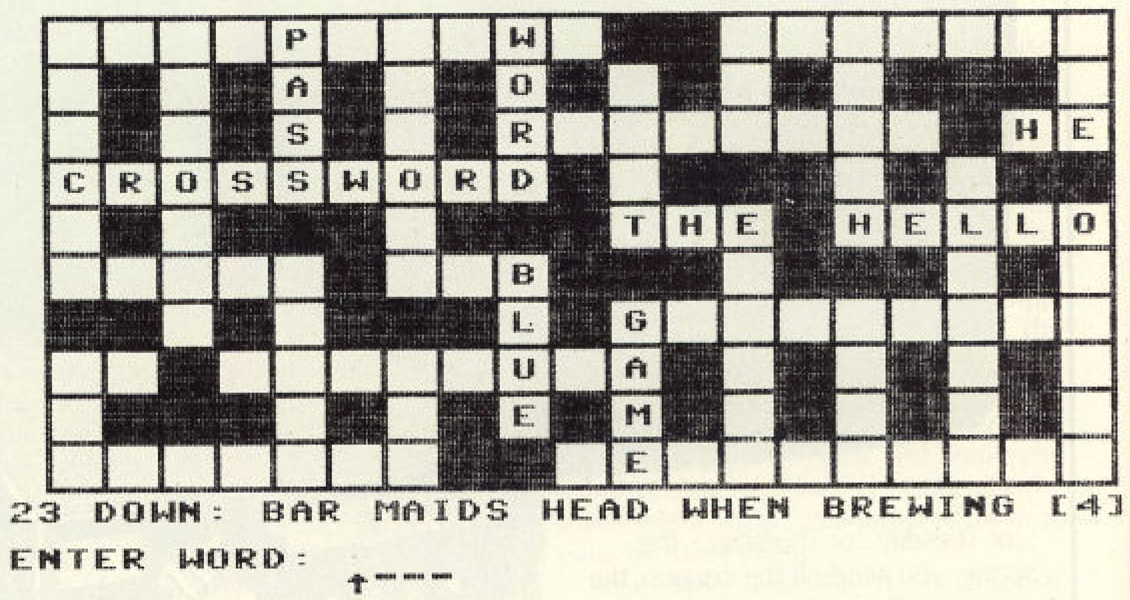
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YC/10/86

CROSSWORD

M R Gilling presents the second part of his excellent crossword program.





AFTER A LONG HARD DAY BLASTING aliens and rescuing the World yet again a crossword is an excellent way to bring you back down to earth. The first part of this Crossword program was printed in *Your Commodore* September 1986, together with all necessary instructions.

If you have entered the first part of this program simply continue entering these programs in the same way and SAVE them on to your disk or cassette after there previous parts. Refer back to last month's issue for instructions on how to RUN the program.

If you want to purchase this program on cassette or disk from our software service the full program is available on both the September 1986 and October 1986 issues.

```
$PROGRAM: 1CROSS LOAD1

2000 FORL=0TO168:CX=0:FORD=0
TO15:READA:CX=CX+A:POKE13824
+L*16+D,A:NEXTD
2010 READA:IFA<>CXTHENPRINT"
ERROR IN LINE";2040+(L*10):S
TOP
2020 NEXTL
2040 DATA1,20,13,15,19,16,8,
5,18,5,7,9,2,12,5,20,175
2050 DATA19,1,14,14,15,21,14
,3,5,9,20,21,14,4,9,12,195
2060 DATA21,20,5,4,16,5,1,14
,9,5,3,5,5,24,9,12,158
2070 DATA5,18,1,20,1,5,18,15
,2,1,20,9,3,19,15,16,168
2080 DATA18,5,3,9,14,3,20,3,
15,14,20,18,15,12,9,13,191
2090 DATA16,12,5,13,5,14,20,
19,1,19,20,21,20,5,13,1,204
2100 DATA21,4,12,9,14,19,1,9
,12,8,1,12,20,5,18,18,183
2110 DATA15,1,4,7,14,21,2,1,
3,15,14,19,5,20,19,14,174
2120 DATA1,16,13,5,14,20,9,1
5,14,1,5,18,9,1,12,5,158
2130 DATA24,3,5,19,19,5,18,1
8,15,18,20,9,14,20,1,20,228
2140 DATA15,13,2,1,18,13,19,
1,3,3,15,12,32,32,32,32,243
2150 DATA32,32,32,32,32,32,3
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2160 DATA32,32,32,32,32,32,3
2,32,32,32,32,32,32,32,32,32
,512
2170 DATA32,32,32,32,32,32,3
2,32,32,32,32,32,32,32,32,32
,512
2180 DATA32,32,32,32,32,32,3
2,32,32,32,32,32,32,32,32,32
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2190 DATA32,32,32,32,32,32,3
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,0,0,0,0,0,0,0
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,0,0,0,0,0,0,0
2240 DATA0,48,40,48,80,48,12
0,48,160,48,200,48,240,48,24
,49,1249
2250 DATA64,49,104,49,144,49
,184,49,224,49,8,50,48,50,88
,50,1259
2260 DATA128,50,168,50,208,5
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152,51,1524
2270 DATA192,51,232,51,16,52
,56,52,96,52,136,52,176,52,2
16,52,1534
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2380 DATA101,54,133,54,165,54,229,54,5,54,69,54,197,70,37,102,1432
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2500 DATA4,6,4,3,5,3,4,7,6,6,5,4,4,4,3,3,71
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3510 DATA49,32,4,15,23,14,58
,32,19,1,7,1,3,9,15,21,303
3520 DATA19,32,19,20,1,20,21
,5,32,27,54,29,32,32,32,32,4
07
3530 DATA32,32,32,32,32,32,3
2,32,50,32,4,15,23,14,58,32,
484
3540 DATA20,23,15,32,19,5,14
,20,9,13,5,14,20,1,12,32,254
3550 DATA12,1,4,9,5,19,32,27
,55,29,32,32,32,32,32,32,385
3560 DATA51,32,4,15,23,14,58
,32,23,9,14,4,32,3,1,20,335
3570 DATA3,8,5,18,32,15,14,3
2,20,8,5,32,13,9,12,12,238
3580 DATA32,27,52,29,32,32,3
2,32,52,32,4,58,32,19,20,15,
500
3590 DATA16,32,20,8,5,32,17,
21,5,5,14,44,1,18,15,21,274
3600 DATA14,4,32,20,8,5,32,1
4,5,3,11,32,32,27,54,29,322
3610 DATA53,32,4,15,23,14,58
,32,20,8,9,19,32,8,15,7,349
3620 DATA32,7,5,20,19,32,9,1
4,32,20,8,5,32,23,1,25,284
3630 DATA32,27,52,29,32,32,3
2,32,54,32,4,15,23,14,58,32,
500
3640 DATA23,9,12,4,5,2,5,5,1
9,20,32,3,1,18,18,25,201
3650 DATA9,14,7,32,14,21,18,
19,5,32,27,51,29,32,32,32,37
4
3660 DATA55,32,4,15,23,14,58
,32,25,15,21,39,22,5,32,8,40
0
3670 DATA1,4,32,9,20,32,6,15
,18,32,2,18,5,1,11,6,212
3680 DATA1,19,20,32,32,27,53
,29,56,32,4,15,23,14,58,32,4
47
3690 DATA1,32,19,21,14,32,3,
15,12,12,5,3,20,9,15,14,227
3700 DATA32,1,20,32,4,21,19,
11,32,27,51,29,32,32,32,32,4
07
3710 DATA57,32,4,15,23,14,58
,32,2,18,5,1,11,32,1,32,337
3720 DATA16,8,15,20,15,7,18,
1,16,8,32,27,52,127,0,223,58
5
5000 PRINT"{CLR}NEW":PRINT"{
DOWN}{DOWN}LOAD"+CHR$(34)+"1
CROSS LOAD2"+CHR$(34)+",1"
5010 REM CHANGE ,1 ABOVE TO
,8 FOR DISK
5020 PRINT"{DOWN}{DOWN}{DOWN
}{DOWN}RUN"
5030 POKE631,13:POKE632,13:P
OKE633,13:POKE198,3:PRINT"{H
OME}"
```

PROGRAM: 1CROSS LOAD2

```
2000 FORL=0TO168:CX=0:FORD=0
TO15:READA:CX=CX+A:POKE16524
+L*16+D,A:NEXTD
2010 READA:IFA<>CXTHENPRINT"
ERROR IN LINE";2040+(L*10):S
TOP
2020 NEXTL
2040 DATA52,29,32,32,32,32,3
2,32,32,32,32,32,49,51,32,4,
537
2050 DATA58,32,16,1,23,14,19
,32,4,18,9,14,11,32,23,9,315
2060 DATA20,8,32,3,8,1,18,7,
5,4,32,1,20,15,13,32,219
2070 DATA32,27,55,29,49,53,3
2,4,58,32,19,9,7,14,1,12,433
2080 DATA32,3,15,12,12,5,3,2
0,15,18,32,15,14,32,20,8,256
2090 DATA5,32,18,15,15,6,32,
32,27,54,29,32,49,55,32,4,43
7
2100 DATA58,32,20,15,15,32,1
3,21,3,8,32,3,1,21,19,5,298
2110 DATA4,32,19,5,24,32,3,5
,19,19,1,20,9,15,14,32,253
2120 DATA32,27,54,29,49,57,3
2,4,15,23,14,58,32,16,18,15,
475
2130 DATA7,18,1,13,13,9,14,7
,32,13,9,19,20,1,11,5,192
2140 DATA32,27,53,29,32,32,3
2,32,32,32,32,32,50,49,32,4,
532
2150 DATA58,32,3,15,12,15,21
,18,32,23,9,20,8,32,16,1,315
2160 DATA9,14,20,32,9,14,20,
5,14,19,9,22,5,12,25,32,261
2170 DATA32,27,52,29,50,50,3
2,4,15,23,14,58,32,19,13,1,4
51
2180 DATA12,12,32,2,9,20,32,
23,9,20,8,32,1,32,2,9,255
2190 DATA7,32,2,1,14,7,32,27
,52,29,32,32,50,51,32,4,404
2200 DATA15,23,14,58,32,2,1,
18,32,13,1,9,4,19,32,8,281
2210 DATA5,1,4,32,23,8,5,14,
32,2,18,5,23,9,14,7,202
2220 DATA32,27,52,29,50,52,3
2,4,15,23,14,58,32,1,14,9,44
4
2230 DATA13,1,12,32,16,15,21
,3,8,32,27,51,29,32,32,32,35
6
2240 DATA32,32,32,32,32,32,3
2,32,32,32,32,32,50,54,32,4,
524
2250 DATA15,23,14,58,32,8,9,
7,8,32,16,1,19,19,32,2,295
2260 DATA5,20,23,5,5,14,32,1
3,15,21,14,20,1,9,14,19,230
2270 DATA32,27,51,29,0,0,0,0
,0,0,0,0,0,0,0,0,139
2280 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2290 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2300 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2310 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2320 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2330 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2340 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2350 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2360 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2370 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2380 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2390 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2400 DATA0,0,0,0,0,0,0,0,0,0
```

```
,0,0,0,0,0,0,0
2410 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2420 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2430 DATA0,0,0,0,21,16,8,15,
12,19,20,5,18,25,6,9,174
2440 DATA4,4,12,5,18,16,18,5
,19,5,14,20,19,15,18,4,196
2450 DATA9,14,1,14,3,5,18,21
,2,8,15,1,18,4,4,9,146
2460 DATA14,7,15,5,12,6,1,16
,18,9,12,6,15,15,12,3,166
2470 DATA1,20,1,3,15,13,2,18
,5,6,21,19,1,12,2,5,144
2480 DATA5,18,2,15,20,20,12,
5,21,14,6,15,12,4,8,5,182
2490 DATA1,4,9,14,7,12,5,1,1
4,20,18,1,14,3,5,18,146
2500 DATA15,16,5,6,15,5,4,9,
20,3,8,18,15,4,4,5,152
2510 DATA1,18,2,1,18,15,14,5
,20,2,1,18,20,5,18,4,162
2520 DATA5,12,5,20,5,15,16,1
,12,19,6,12,15,7,1,2,153
2530 DATA12,5,12,9,4,15,16,1
,18,1,12,12,32,32,32,32,245
2540 DATA32,32,32,32,32,32,3
2,32,32,32,32,32,32,32,32,32
,512
2550 DATA32,32,32,32,32,32,3
2,32,32,32,32,32,32,32,32,32
,512
2560 DATA32,32,32,32,32,32,3
2,32,32,32,32,32,32,32,32,32
,512
2570 DATA32,32,32,32,32,32,3
2,32,32,32,32,32,32,32,32,32
,512
2580 DATA32,32,32,32,32,32,3
2,32,32,32,32,32,32,32,32,32
,512
2590 DATA32,32,32,32,0,0,0,0
,0,0,0,0,0,0,0,0,128
2600 DATA0,0,0,0,48,49,48,50
,48,51,48,52,0,0,0,0,394
2610 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2620 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2630 DATA0,0,0,0,0,48,40,48,
80,48,120,48,160,48,200,48,8
88
2640 DATA240,48,24,49,64,49,
104,49,144,49,184,49,224,49,
8,50,1384
2650 DATA48,50,88,50,128,50,
168,50,208,50,248,50,32,51,7
2,51,1394
2660 DATA112,51,152,51,192,5
1,232,51,16,52,56,52,96,52,1
36,52,1404
2670 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2680 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2690 DATA0,0,0,0,0,0,0,0,0,1
,0,0,0,0,0,0,1
2700 DATA0,0,0,0,0,0,1,1,0,1
,0,1,0,0,0,1,5
2710 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2720 DATA0,0,0,0,13,13,13,13
,13,13,13,13,13,13,13,13,156
2730 DATA14,14,14,14,14,14,1
4,14,14,14,14,14,14,14,14,14
,224
2740 DATA14,14,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,28
2750 DATA0,0,0,0,37,54,229,5
4,165,86,37,102,197,118,5,11
8,1202
2760 DATA37,134,133,134,197,
150,85,166,37,198,181,198,37
,54,69,54,1864
2770 DATA101,54,133,54,165,5
4,229,54,5,54,69,54,197,70,3
7,102,1432
2780 DATA229,118,69,118,101,
134,165,134,197,150,5,150,37
,166,133,166,2072
2790 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2800 DATA0,0,0,0,0,10,17,25,
34,37,42,47,50,59,67,74,462
2810 DATA84,90,97,101,107,11
1,114,119,122,126,133,139,14
5,150,154,158,1950
2820 DATA162,165,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,327
2830 DATA0,0,12,30,42,4,66,4
,218,4,26,5,126,5,134,5,681
2840 DATA186,5,198,5,30,6,96
,6,250,6,12,7,42,4,46,4,903
2850 DATA50,4,54,4,58,4,66,4
,70,4,78,4,142,4,58,5,609
2860 DATA130,5,142,5,194,5,2
02,5,30,6,38,6,90,6,102,6,97
2
2870 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2880 DATA0,0,0,0,10,7,8,9,3,
5,5,3,9,8,7,10,84
2890 DATA6,7,4,6,4,3,5,3,4,7
,6,6,5,4,4,4,78
2900 DATA3,3,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,6
2910 DATA0,0,0,0,64,65,66,67
,66,67,66,67,66,67,66,67,794
2920 DATA66,67,66,67,66,67,6
6,67,66,68,69,69,69,70,66,67
,1076
2930 DATA66,67,66,67,66,67,6
6,67,66,67,66,71,64,72,64,72
,1074
2940 DATA64,72,64,72,64,72,6
4,72,64,72,64,72,64,72,64,72
,1088
2950 DATA64,73,74,74,74,75,6
4,72,64,72,64,72,64,72,64,72
,1114
2960 DATA64,72,64,72,64,76,6
6,77,69,78,66,77,69,78,66,77
,1135
2970 DATA69,78,66,77,69,78,6
6,77,69,79,80,81,74,82,66,77
,1188
2980 DATA69,78,66,77,69,83,6
9,83,69,78,66,84,64,72,64,73
,1164
2990 DATA74,75,64,73,74,75,6
4,73,74,75,64,73,74,75,64,73
,1144
3000 DATA74,75,64,73,74,75,6
4,73,74,75,64,73,74,74,74,74
,1154
3010 DATA74,75,64,72,64,76,6
6,85,74,82,66,85,74,82,66,85
,1190
3020 DATA74,82,66,85,74,82,6
6,86,80,87,66,86,80,87,66,86
,1253
3030 DATA80,87,66,86,80,81,7
4,74,74,82,66,84,64,72,64,73
,1207
3040 DATA74,75,64,73,74,75,6
4,73,74,75,64,73,74,75,64,72
,1143
3050 DATA64,72,64,72,64,72,6
4,72,64,72,64,72,64,73,74,74
,1101
3060 DATA74,75,64,72,64,76,6
6,86,80,87,66,86,80,87,66,86
,1215
3070 DATA80,87,66,86,80,87,6
6,77,69,78,66,77,69,83,69,83
,1223
3080 DATA69,78,66,77,69,79,8
0,81,74,94,69,90,64,72,64,72
,1198
3090 DATA64,72,64,72,64,72,6
4,72,64,72,64,72,64,72,64,73
,1089
3100 DATA74,75,64,73,74,74,7
4,74,74,75,64,73,74,75,64,73
,1154
3110 DATA74,74,74,75,64,76,6
6,77,69,78,66,77,69,83,69,83
,1174
3120 DATA69,78,66,77,69,83,6
9,91,74,82,66,86,80,92,80,81
,1243
3130 DATA74,82,66,86,80,87,6
6,86,80,92,80,93,64,72,64,73
,1245
3140 DATA74,75,64,73,74,74,7
4,74,74,75,64,73,74,74,74,74
,1164
3150 DATA74,75,64,72,64,72,6
4,73,74,75,64,72,64,72,64,72
,1115
3160 DATA64,72,64,72,64,76,6
6,86,80,87,66,86,80,92,80,81
,1216
3170 DATA74,82,66,86,80,92,8
0,81,74,94,69,83,69,78,66,85
,1259
3180 DATA74,94,69,83,69,78,6
6,77,69,78,66,84,64,72,64,72
,1179
3190 DATA64,72,64,72,64,72,6
4,73,74,75,64,72,64,72,64,73
,1103
3200 DATA74,74,74,74,74,75,6
4,73,74,74,74,74,74,75,64,73
,1164
3210 DATA74,75,64,72,64,95,6
9,83,69,78,66,77,69,78,66,85
,1184
3220 DATA74,94,69,83,69,78,6
6,85,74,88,80,92,80,87,66,86
,1271
3230 DATA80,92,80,92,80,87,6
6,86,80,87,66,84,64,73,74,74
,1265
3240 DATA74,75,64,73,74,75,6
4,73,74,74,74,74,74,75,64,73
,1154
3250 DATA74,75,64,72,64,72,6
4,72,64,72,64,72,64,72,64,72
,1101
3260 DATA64,72,64,72,64,96,8
0,81,74,94,69,79,80,87,66,86
,1228
3270 DATA80,92,80,92,80,87,6
6,86,80,87,66,77,69,78,66,77
,1263
3280 DATA69,78,66,77,69,78,6
6,77,69,78,66,84,64,72,64,73
,1150
3290 DATA74,74,74,75,64,72,6
4,72,64,72,64,72,64,72,64,72
,1113
3300 DATA64,72,64,73,74,75,6
4,73,74,75,64,73,74,75,64,73
,1131
3310 DATA74,75,64,72,64,76,6
6,85,74,74,74,94,69,78,66,77
,1182
3320 DATA69,78,66,77,69,78,6
6,77,69,78,66,85,74,82,66,85
,1185
```

CROSSWORD

```
3330 DATA74,82,66,85,74,82,6
6,85,74,82,66,84,64,72,64,73
,1193
3340 DATA74,74,74,74,74,75,6
4,73,74,75,64,73,74,75,64,73
,1154
3350 DATA74,75,64,73,74,75,6
4,73,74,75,64,73,74,75,64,73
,1144
3360 DATA74,75,64,72,64,76,6
6,86,80,92,80,92,80,87,66,86
,1240
3370 DATA80,87,66,85,74,94,6
9,79,80,87,66,86,80,87,66,86
,1272
3380 DATA80,87,66,86,80,87,6
6,86,80,87,66,84,64,72,64,72
,1227
3390 DATA64,72,64,72,64,72,6
4,72,64,72,64,73,74,74,74,75
,1114
3400 DATA64,72,64,72,64,72,6
4,72,64,72,64,72,64,72,64,72
,1088
3410 DATA64,72,64,72,64,97,6
6,98,66,98,66,98,66,98,66,98
,1253
3420 DATA66,98,66,99,80,80,8
0,100,66,98,66,98,66,98,66,9
8,1325
3430 DATA66,98,66,98,66,98,6
6,98,66,98,66,101,112,113,11
4,115,1441
3440 DATA116,117,118,119,120
,121,122,123,124,125,126,127
,128,129,130,131,1976
3450 DATA132,133,134,135,136
,137,138,139,140,141,142,143
,144,145,146,147,2232
3460 DATA148,149,150,151,160
,161,162,163,164,165,166,167
,168,169,170,171,2584
3470 DATA172,173,174,175,176
,177,178,179,180,181,182,183
,184,185,186,187,2872
3480 DATA188,189,190,191,192
,193,194,195,196,197,198,199
,32,32,32,32,2450
3490 DATA32,32,32,32,32,32,3
2,32,32,32,32,32,32,32,32,32
,512
3500 DATA32,32,32,32,32,32,3
2,32,32,32,32,32,32,32,32,32
,512
3510 DATA32,32,32,32,32,32,3
2,32,32,32,32,32,32,32,32,32
,512
3520 DATA32,32,32,32,32,32,3
2,32,32,32,32,32,32,32,32,32
,512
3530 DATA32,32,32,32,32,32,3
2,32,32,32,32,32,32,32,32,32
,512
3540 DATA32,32,32,32,32,32,3
2,32,32,32,32,32,32,32,32,32
,512
3550 DATA32,32,32,32,49,32,1
,58,32,13,9,24,32,8,15,12,41
3
3560 DATA5,19,32,21,16,44,20
,18,25,32,3,15,22,5,18,32,32
7
3570 DATA21,16,32,10,15,2,32
,32,27,49,48,29,54,32,1,3,40
3
3580 DATA18,15,19,19,58,32,2
,5,14,20,32,13,21,19,9,3,299
3590 DATA9,1,14,32,32,27,55,
29,32,32,32,32,32,32,32,32,4
55
3600 DATA32,32,32,32,49,48,3
2,1,3,58,32,9,14,20,18,15,42
7
3610 DATA4,21,3,5,19,32,1,20
,32,1,32,3,5,12,5,2,197
3620 DATA18,1,20,9,15,14,32,
32,27,56,29,32,49,49,32,1,41
6
3630 DATA3,18,15,19,19,58,32
,9,32,3,1,14,32,4,18,15,292
3640 DATA14,5,32,1,19,32,1,3
2,18,21,12,5,32,32,27,57,340
3650 DATA29,32,32,32,49,51,3
2,1,3,18,15,19,19,58,32,3,42
5
3660 DATA8,1,6,5,32,6,15,18,
32,1,32,7,5,14,9,5,196
3670 DATA32,32,27,51,29,32,3
2,32,32,32,32,32,49,53,32,1,
530
3680 DATA3,18,15,19,19,58,32
,14,15,20,8,9,14,7,32,9,292
3690 DATA14,32,8,1,18,4,32,1
9,20,15,3,11,32,32,27,53,321
3700 DATA29,32,32,32,49,55,3
2,1,3,18,15,19,19,58,32,23,4
49
3710 DATA9,12,4,32,7,15,4,32
,9,14,32,1,21,19,20,18,249
3720 DATA1,12,9,1,32,32,27,5
3,29,32,32,32,49,127,0,223,6
91
5000 PRINT"(CLR)NEW":PRINT"(
DOWN)(DOWN)LOAD"+CHR$(34)+"1
CROSS LOAD3"+CHR$(34)+",1"
5010 REM CHANGE ,1 TO ,8 IF
USING DISK
5020 PRINT"(DOWN)(DOWN)(DOWN
)(DOWN)RUN"
5030 POKE631,13:POKE632,13:P
OKE633,13:POKE198,3:PRINT"(H
OME)"
```

PROGRAM:1CROSS LOAD3

```
2000 FORL=0TO168:CX=0:FORD=0
TO15:READA:CX=CX+A:POKE19224
+L*16+D,A:NEXTD
2010 READA:IFA<>CXTHENPRINT"
ERROR IN LINE";2040+(L*10):S
TOP
2020 NEXTL
2040 DATA49,57,32,1,3,18,15,
19,19,58,32,23,15,15,4,12,37
2
2050 DATA1,14,4,32,19,16,18,
9,20,5,32,32,27,51,29,32,341
2060 DATA32,32,32,32,32,32,3
2,32,50,49,32,1,3,58,32,8,48
9
2070 DATA5,32,6,15,12,12,15,
23,19,32,20,8,5,32,13,1,250
2080 DATA18,3,8,32,8,1,18,5,
32,32,27,53,44,52,29,32,394
2090 DATA50,52,32,1,3,58,32,
21,14,4,5,18,7,18,15,21,351
2100 DATA14,4,32,2,21,18,9,1
,12,32,3,8,1,13,2,5,177
2110 DATA18,32,32,27,56,29,3
2,32,50,54,32,1,3,18,15,19,4
50
2120 DATA19,58,32,4,5,14,9,1
,12,32,15,6,32,19,5,1,264
2130 DATA12,32,6,21,18,32,32
,27,55,29,32,32,32,32,32,32,
456
2140 DATA50,55,32,1,3,18,15,
19,19,58,32,14,15,20,32,1,38
4
2150 DATA32,4,18,1,21,7,8,20
,32,3,15,14,20,1,9,14,219
2160 DATA5,18,32,27,52,44,54
,29,49,32,4,15,23,14,58,32,4
88
2170 DATA6,15,21,14,4,32,53,
48,32,20,15,32,19,20,18,1,35
0
2180 DATA9,7,8,20,5,14,32,15
,21,20,32,32,27,54,29,32,357
2190 DATA50,32,4,15,23,14,58
,32,20,8,5,32,23,1,25,32,374
2200 DATA20,15,32,7,15,32,6,
15,18,32,1,32,20,9,20,12,286
2210 DATA5,32,32,27,55,29,32
,32,51,32,4,15,23,14,58,32,4
73
2220 DATA9,14,3,12,9,14,5,4,
32,20,15,32,2,5,32,20,228
2230 DATA8,9,14,32,32,27,52,
29,32,32,32,32,32,32,32,32,4
59
2240 DATA52,32,4,15,23,14,58
,32,3,1,14,20,5,18,32,9,332
2250 DATA14,32,1,32,4,1,26,5
,32,32,27,54,29,32,32,32,385
2260 DATA32,32,32,32,32,32,3
2,32,53,32,4,15,23,14,58,32,
487
2270 DATA3,15,18,4,32,6,18,1
5,13,32,5,22,5,18,32,15,253
2280 DATA16,5,14,32,19,20,15
,18,5,32,32,27,52,29,32,32,3
80
2290 DATA54,32,4,15,23,14,58
,32,8,5,39,19,32,14,15,32,39
6
2300 DATA6,18,9,5,14,4,32,32
,27,51,29,32,32,32,32,32,387
2310 DATA32,32,32,32,32,32,3
2,32,55,32,4,15,23,14,58,32,
489
2320 DATA4,21,13,16,32,9,14,
32,1,32,3,8,1,14,14,5,219
2330 DATA12,32,32,27,53,29,3
2,32,32,32,32,32,32,32,32,32
,505
2340 DATA56,32,4,15,23,14,58
,32,1,14,7,12,5,18,19,32,342
2350 DATA16,5,18,3,8,32,32,2
7,51,29,32,32,32,32,32,32,41
3
2360 DATA32,32,32,32,32,32,3
2,32,57,32,4,58,32,1,32,18,4
90
2370 DATA5,4,32,4,9,19,15,18
,4,5,18,32,20,15,32,1,233
2380 DATA32,12,15,22,5,4,32,
15,14,5,32,32,27,52,29,32,36
0
2390 DATA49,50,32,4,15,23,14
,58,32,13,9,24,5,4,32,21,385
```

```
2400 DATA16,44,15,18,32,1,32
,2,5,14,20,32,20,9,20,12,292
2410 DATA5,32,32,27,55,29,32
,32,49,52,32,4,15,23,14,58,4
91
2420 DATA32,32,5,24,3,8,1,14
,7,5,32,2,1,18,18,5,207
2430 DATA20,32,32,27,54,29,3
2,32,32,32,32,32,32,32,32,32
,514
2440 DATA49,54,32,4,15,23,14
,58,32,32,12,5,20,32,4,5,391
2450 DATA5,32,18,5,13,15,22,
5,32,9,20,32,32,27,54,29,350
2460 DATA32,32,32,32,32,32,3
2,32,49,56,32,4,15,23,14,58,
507
2470 DATA32,7,5,13,19,32,6,1
5,18,32,1,32,12,15,14,5,258
2480 DATA12,25,32,13,1,14,32
,32,27,53,29,32,32,32,32,32,
430
2490 DATA50,48,32,4,15,23,14
,58,32,32,2,5,1,20,32,1,369
2500 DATA20,32,3,18,1,26,25,
32,7,15,12,6,32,32,27,52,340
2510 DATA29,32,32,32,32,32,3
2,32,50,49,32,4,15,23,14,58,
498
2520 DATA32,5,14,4,12,5,19,1
9,32,20,1,2,12,5,20,32,234
2530 DATA9,19,32,23,9,12,12,
9,14,7,32,32,27,52,29,32,350
2540 DATA50,50,32,4,58,32,9,
4,15,12,32,15,6,32,20,8,379
2550 DATA5,32,16,12,5,1,19,2
1,18,5,32,18,5,19,15,18,241
2560 DATA20,32,32,27,52,29,3
2,32,50,51,32,4,58,32,18,1,5
02
2570 DATA16,32,1,2,15,21,20,
32,18,9,7,8,20,32,6,15,254
2580 DATA18,32,20,8,5,32,3,1
5,21,18,19,5,32,27,51,29,335
2590 DATA50,53,32,4,15,23,14
,58,32,20,8,5,32,1,14,19,380
2600 DATA23,5,18,32,9,19,32,
5,22,5,18,25,20,8,9,14,264
2610 DATA7,32,32,27,51,29,32
,32,0,0,0,0,0,0,0,0,242
2620 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2630 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2640 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2650 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2660 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2670 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2680 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2690 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2700 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2710 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2720 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2730 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2740 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2750 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2760 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2770 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2780 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2790 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2800 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2810 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2820 DATA0,0,0,0,0,0,0,0,7,1
8,9,14,4,19,20,15,106
2830 DATA14,5,8,15,16,19,11,
9,16,14,5,3,5,19,19,1,179
2840 DATA18,25,19,1,9,14,5,4
,9,20,7,1,12,5,14,1,164
2850 DATA20,15,14,14,1,7,5,1
5,1,20,19,1,13,9,18,7,179
2860 DATA15,18,9,12,12,1,3,1
2,9,5,14,20,12,1,19,5,167
2870 DATA9,18,1,14,16,18,9,1
4,3,9,16,1,12,19,25,13,197
2880 DATA16,20,15,13,21,14,9
,12,1,20,5,18,1,12,7,5,189
2890 DATA14,5,20,9,3,19,9,14
,3,5,14,4,9,1,18,25,172
2900 DATA4,9,19,4,1,9,14,20,
18,1,3,5,8,5,1,20,141
2910 DATA19,16,1,14,7,9,14,2
0,5,18,12,15,16,5,18,25,214
2920 DATA5,15,13,1,14,19,9,2
0,18,5,16,16,1,18,1,12,183
2930 DATA12,5,12,4,1,9,19,1,
16,18,9,3,15,20,1,12,157
2940 DATA1,18,13,7,18,9,12,1
2,20,9,14,20,32,32,32,32,281
2950 DATA32,32,32,32,32,32,3
2,32,32,32,32,32,32,32,32,32
,512
2960 DATA32,32,32,32,32,32,3
2,32,32,32,32,32,32,32,32,32
,512
2970 DATA32,32,32,32,32,32,3
2,32,32,32,32,32,32,32,32,32
,512
2980 DATA32,32,32,32,32,32,3
2,32,0,0,0,0,0,0,0,0,256
2990 DATA0,0,0,0,0,0,0,48,
49,48,50,48,51,48,52,394
3000 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
3010 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
3020 DATA0,0,0,0,0,0,0,0,0,4
8,40,48,80,48,120,48,432
3030 DATA160,48,200,48,240,4
8,24,49,64,49,104,49,144,49,
184,49,1509
3040 DATA224,49,8,50,48,50,8
8,50,128,50,168,50,208,50,24
8,50,1519
3050 DATA32,51,72,51,112,51,
152,51,192,51,232,51,16,52,5
6,52,1274
3060 DATA96,52,136,52,176,52
,0,0,0,0,0,0,0,0,0,0,564
3070 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
3080 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
3090 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,1,0,1
3100 DATA0,1,0,1,0,0,0,0,0,0
,0,0,0,0,0,0,2
3110 DATA0,0,0,0,0,0,0,0,13,
13,13,13,13,13,13,13,104
3120 DATA13,13,13,13,13,13,1
3,13,14,14,14,14,14,14,14,14
,216
3130 DATA14,14,14,14,14,14,1
4,0,0,0,0,0,0,0,0,0,98
3140 DATA0,0,0,0,0,0,0,0,37,
54,213,54,37,86,197,86,764
3150 DATA165,102,245,102,37,
118,165,118,149,134,229,134,
37,150,149,150,2184
3160 DATA117,166,197,166,53,
198,181,198,37,54,69,54,101,
54,133,54,1832
3170 DATA213,54,245,54,37,54
,165,86,197,86,69,86,181,102
,5,102,1736
3180 DATA149,134,229,134,117
,150,0,0,0,0,0,0,0,0,0,0,913
3190 DATA0,0,0,0,0,0,0,0,0,1
0,17,26,30,34,40,47,204
3200 DATA51,55,62,68,72,76,8
5,92,102,110,120,127,132,137
,141,151,1581
3210 DATA157,163,171,175,182
,187,192,0,0,0,0,0,0,0,0,0,1
227
3220 DATA0,0,0,0,0,0,16,31,4
2,4,64,4,202,4,222,4,593
3230 DATA42,5,52,5,106,5,122
,5,200,5,210,5,10,6,24,6,808
3240 DATA100,6,110,6,252,6,1
2,7,42,4,46,4,50,4,54,4,707
3250 DATA64,4,68,4,74,4,218,
4,222,4,238,4,44,5,54,5,1016
3260 DATA200,5,210,5,20,6,0,
0,0,0,0,0,0,0,0,0,446
3270 DATA0,0,0,0,0,0,0,0,10,
7,9,4,4,6,7,4,51
3280 DATA4,7,6,4,4,9,7,10,8,
10,7,5,5,4,10,6,106
3290 DATA6,8,4,7,5,5,4,0,0,0
,0,0,0,0,0,0,39
3300 DATA0,0,0,0,0,0,0,0,64,
65,66,67,66,67,66,67,528
3310 DATA66,67,66,67,66,67,6
6,67,66,67,66,67,66,68,69,70
,1071
3320 DATA66,67,66,67,66,67,6
6,67,66,67,66,67,66,68,69,10
4,1105
3330 DATA64,72,64,72,64,72,6
4,72,64,72,64,72,64,72,64,72
,1088
3340 DATA64,72,64,72,64,73,7
4,75,64,72,64,72,64,72,64,72
,1102
3350 DATA64,72,64,72,64,73,7
4,75,64,76,66,77,69,78,66,77
,1131
3360 DATA69,78,66,77,69,78,6
6,77,69,83,69,83,69,91,74,82
,1200
3370 DATA66,77,69,78,66,77,6
9,83,69,78,66,77,69,91,74,75
,1184
3380 DATA64,72,64,73,74,75,6
4,73,74,75,64,73,74,75,64,73
,1131
3390 DATA74,74,74,74,74,74,7
4,75,64,73,74,75,64,73,74,74
,1164
3400 DATA74,75,64,73,74,74,7
4,75,64,76,66,86,80,87,66,86
,1194
3410 DATA80,87,66,86,80,87,6
6,86,80,92,80,81,74,88,80,87
,1300
3420 DATA66,86,80,87,66,85,7
4,74,74,82,66,85,74,88,80,93
,1260
3430 DATA64,72,64,72,64,72,6
4,72,64,72,64,72,64,72,64,72
,1088
3440 DATA64,72,64,73,74,75,6
4,72,64,72,64,72,64,73,74,74
,1115
```

```
3450 DATA74,75,64,73,74,75,6
4,72,64,76,66,77,69,78,66,77
,1144
3460 DATA69,78,66,77,69,78,6
6,77,69,78,66,86,80,87,66,10
7,1219
3470 DATA66,77,69,78,66,86,8
0,92,80,87,66,86,80,87,66,84
,1250
3480 DATA64,72,64,73,74,75,6
4,73,74,75,64,73,74,75,64,73
,1131
3490 DATA74,75,64,72,64,72,6
4,72,64,73,74,75,64,72,64,72
,1115
3500 DATA64,72,64,72,64,72,6
4,72,64,76,66,86,80,87,66,86
,1155
3510 DATA80,87,66,86,80,87,6
6,85,74,82,66,107,66,107,66,
107,1312
3520 DATA66,85,74,94,69,78,6
6,77,69,78,66,77,69,78,66,84
,1196
3530 DATA64,72,64,72,64,72,6
4,72,64,72,64,72,64,72,64,73
,1089
3540 DATA74,75,64,72,64,72,6
4,72,64,73,74,74,74,75,64,73
,1128
3550 DATA74,75,64,73,74,75,6
4,72,64,76,66,77,69,78,66,77
,1144
3560 DATA69,78,66,77,69,83,6
9,79,80,87,66,107,66,107,66,
77,1246
3570 DATA69,79,80,92,80,87,6
6,86,80,87,66,86,80,87,66,84
,1275
3580 DATA64,72,64,73,74,75,6
4,73,74,75,64,73,74,74,74,75
,1142
3590 DATA64,72,64,72,64,72,6
4,73,74,75,64,72,64,72,64,72
,1102
3600 DATA64,72,64,72,64,72,6
4,72,64,76,66,86,80,87,66,86
,1155
3610 DATA80,87,66,86,80,81,7
4,82,66,107,66,107,66,107,66
,85,1306
3620 DATA74,82,66,77,69,78,6
6,77,69,78,66,77,69,78,66,84
,1176
3630 DATA64,72,64,72,64,72,6
4,72,64,72,64,72,64,73,74,75
,1102
3640 DATA64,72,64,72,64,72,6
4,73,74,75,64,73,74,75,64,73
,1117
3650 DATA74,75,64,73,74,75,6
4,72,64,76,66,77,69,78,66,77
,1144
3660 DATA69,83,69,78,66,86,8
0,87,66,107,66,77,69,78,66,8
6,1233
3670 DATA80,87,66,86,80,87,6
6,86,80,87,66,86,80,87,66,84
,1274
3680 DATA64,72,64,73,74,75,6
4,73,74,74,74,75,64,72,64,72
,1128
3690 DATA64,72,64,73,74,75,6
4,72,64,72,64,72,64,72,64,72
,1102
3700 DATA64,72,64,72,64,72,6
4,72,64,95,69,91,74,82,66,85
,1170
3710 DATA74,74,74,82,66,77,6
9,78,66,77,69,91,74,94,69,83
,1217
3720 DATA69,78,66,77,69,78,6
6,77,69,78,66,77,69,127,0,22
3,1289
5000 PRINT"(CLR)NEW":PRINT"(
DOWN)(DOWN)LOAD"+CHR$(34)+"1
CROSS LOAD4"+CHR$(34)+",1"
5010 REM CHANGE ,1 TO ,8 FOR
 DISK USE
5020 PRINT"(DOWN)(DOWN)(DOWN
)(DOWN)RUN"
5030 POKE631,13:POKE632,13:P
OKE633,13:POKE198,3:PRINT"(H
OME)"
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PROGRAM:1CROSS LOAD4

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2000 FORL=0TO168:CX=0:FORD=0
TO15:READA:CX=CX+A:POKE21924
+L*16+D,A:NEXTD
2010 READA:IFA<>CXTHENPRINT"
ERROR IN LINE";2040+(L*10):S
TOP
2020 NEXTL
2040 DATA69,78,66,84,64,73,7
4,74,74,75,64,73,74,74,74,75
,1165
2050 DATA64,73,74,75,64,73,7
4,74,74,74,74,74,74,75,64,73
,1153
2060 DATA74,75,64,73,74,75,6
4,73,74,75,64,72,64,73,74,88
,1156
2070 DATA80,87,66,86,80,92,8
0,87,66,86,80,87,66,85,74,88
,1290
2080 DATA80,92,80,92,80,87,6
6,86,80,87,66,86,80,87,66,86
,1301
2090 DATA80,87,66,84,64,73,7
4,75,64,72,64,72,64,72,64,72
,1147
2100 DATA64,72,64,72,64,73,7
4,75,64,72,64,72,64,72,64,72
,1102
2110 DATA64,72,64,72,64,72,6
4,72,64,72,64,72,64,105,80,1
00,1165
2120 DATA66,98,66,98,66,98,6
6,98,66,98,66,98,66,99,80,10
0,1329
2130 DATA66,98,66,98,66,98,6
6,98,66,98,66,98,66,98,66,98
,1312
2140 DATA66,98,66,101,112,11
3,114,115,116,117,118,119,12
0,121,122,123,1741
2150 DATA124,125,126,127,128
,129,130,131,132,133,134,135
,136,137,138,139,2104
2160 DATA140,141,142,143,144
,145,146,147,148,149,150,151
,160,161,162,163,2392
2170 DATA164,165,166,167,168
,169,170,171,172,173,174,175
,176,177,178,179,2744
2180 DATA180,181,182,183,184
,185,186,187,188,189,190,191
,192,193,194,195,3000
2190 DATA196,197,198,199,32,
32,32,32,32,32,32,32,32,32,3
2,32,1174
2200 DATA32,32,32,32,32,32,3
2,32,32,32,32,32,32,32,32,32
,512
2210 DATA32,32,32,32,32,32,3
2,32,32,32,32,32,32,32,32,32
,512
2220 DATA32,32,32,32,32,32,3
2,32,32,32,32,32,32,32,32,32
,512
2230 DATA32,32,32,32,32,32,3
2,32,32,32,32,32,32,32,32,32
,512
2240 DATA32,32,32,32,32,32,3
2,32,32,32,32,32,32,32,32,32
,512
2250 DATA32,32,32,32,32,32,3
2,32,32,32,32,32,49,32,1,3,4
69
2260 DATA58,32,14,15,19,5,32
,8,5,18,5,32,20,15,32,23,333
2270 DATA15,18,11,32,9,14,3,
5,19,19,1,14,20,12,25,32,249
2280 DATA27,49,48,29,53,32,1
,3,58,6,9,18,19,20,32,20,424
2290 DATA23,15,32,16,1,18,20
,19,32,15,6,32,20,18,9,16,29
2
2300 DATA12,5,32,10,21,13,16
,27,51,44,52,29,56,32,1,3,40
4
2310 DATA18,15,19,19,58,32,9
,14,4,9,19,16,5,14,19,1,271
2320 DATA2,12,5,32,1,19,32,1
9,3,5,14,5,18,25,32,32,256
2330 DATA27,57,29,32,49,48,3
2,1,3,58,32,1,32,19,9,14,443
2340 DATA44,13,1,11,5,32,19,
9,7,14,32,15,6,32,20,8,268
2350 DATA5,32,3,18,15,19,19,
32,32,27,52,29,49,50,32,1,41
5
2360 DATA3,18,15,19,19,58,32
,16,18,5,16,1,18,5,32,4,279
2370 DATA9,5,20,32,6,15,18,3
2,9,19,19,21,5,32,32,27,301
2380 DATA52,29,32,32,49,52,3
2,1,3,18,15,19,19,58,32,13,4
56
2390 DATA9,24,32,1,14,7,5,12
,32,23,9,20,8,32,1,32,261
2400 DATA12,5,1,4,32,15,18,5
,32,27,54,29,49,54,32,1,370
2410 DATA3,58,32,14,15,20,5,
32,14,1,7,39,19,32,3,1,295
2420 DATA18,18,25,9,14,7,32,
3,1,16,1,3,9,20,25,32,233
2430 DATA32,27,55,29,49,55,3
2,1,3,58,32,2,18,5,1,11,410
2440 DATA32,5,1,18,12,25,32,
20,15,1,19,20,32,6,15,18,271
2450 DATA32,3,5,18,5,1,12,32
,32,27,52,29,49,56,32,1,386
2460 DATA3,18,15,19,19,58,32
,9,18,13,1,32,2,5,3,15,262
2470 DATA13,5,19,32,13,21,19
,12,5,13,32,18,21,12,5,18,25
8
2480 DATA32,27,52,29,49,57,3
2,1,3,58,32,7,9,18,12,32,450
2490 DATA23,9,20,8,32,12,32,
16,12,1,20,5,44,23,8,1,266
2500 DATA20,32,1,14,32,1,16,
5,32,27,55,29,50,48,32,1,395
2510 DATA3,18,15,19,19,58,32
,49,48,48,44,53,48,44,49,48,
595
2520 DATA32,1,14,4,32,49,32,
3,21,19,20,15,13,5,18,32,310
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2530 DATA32,27,54,29,50,50,32,1,58,32,10,21,13,2,12,5,428
2540 DATA32,19,1,12,5,44,15,16,5,18,1,20,5,32,1,19,245
2550 DATA32,1,32,12,1,19,5,18,32,27,52,29,50,51,32,1,394
2560 DATA58,32,9,14,32,1,32,8,21,18,18,25,32,20,15,32,367
2570 DATA6,15,18,5,9,7,14,32,3,15,21,14,20,18,25,32,254
2580 DATA32,27,52,29,50,52,32,1,3,58,32,3,1,20,3,8,403
2590 DATA32,3,1,18,16,32,9,14,32,12,9,16,32,6,15,18,265
2600 DATA32,8,5,1,4,32,32,27,57,29,32,32,50,53,32,1,427
2610 DATA58,32,4,18,46,12,15,15,11,19,32,6,15,18,32,20,353
2620 DATA8,9,19,32,9,14,32,20,15,13,13,25,39,19,32,16,315
2630 DATA32,27,55,29,50,54,32,1,58,32,21,14,18,5,1,12,441
2640 DATA32,20,1,9,12,32,20,8,1,20,32,9,19,32,15,14,276
2650 DATA5,45,19,9,4,5,4,32,27,49,48,29,49,32,4,58,419
2660 DATA32,3,46,5,46,19,9,7,14,5,20,32,6,15,18,32,309
2670 DATA19,20,21,4,25,32,15,6,32,8,5,18,5,4,9,20,243
2680 DATA25,27,56,29,50,32,4,58,32,1,14,25,32,49,32,23,489
2690 DATA9,20,8,32,3,9,14,4,5,18,44,7,21,9,12,20,235
2700 DATA25,32,15,6,32,1,18,19,15,14,32,32,51,32,4,15,343
2710 DATA23,14,58,32,4,9,4,44,1,19,32,9,14,32,3,15,313
2720 DATA14,20,5,13,16,20,32,32,27,55,29,32,32,32,32,32,423
2730 DATA32,32,32,32,52,32,4,15,23,14,58,32,3,15,16,25,417
2740 DATA32,15,21,20,32,13,9,14,21,20,5,32,17,21,1,14,287
2750 DATA20,9,20,25,32,32,27,53,29,32,32,32,53,32,4,15,447
2760 DATA23,14,58,32,3,15,14,19,21,13,5,19,32,4,21,18,311
2770 DATA9,14,7,32,3,15,15,11,9,14,7,32,32,27,53,29,309
2780 DATA32,32,32,32,54,32,4,15,23,14,58,32,1,3,8,5,377
2790 DATA32,32,6,15,18,32,32,6,15,15,4,32,32,27,52,29,379
2800 DATA32,32,32,32,32,32,32,32,32,32,32,32,55,32,4,58,533
2810 DATA32,5,46,12,46,15,46,16,18,9,14,20,5,18,32,7,341
2820 DATA1,20,5,3,18,1,19,8,5,19,32,16,1,18,20,25,211
2830 DATA27,49,48,29,57,32,4,58,32,13,15,14,5,25,32,1,441
2840 DATA14,4,32,1,32,19,5,18,22,1,14,20,32,9,14,32,269
2850 DATA18,15,25,1,12,32,16,1,12,1,3,5,49,48,32,4,274
2860 DATA58,2,5,32,19,5,1,20,5,4,44,23,8,9,12,5,252
2870 DATA32,1,7,5,14,20,32,7,9,22,5,19,32,1,3,3,212
2880 DATA15,21,14,20,49,49,32,4,58,32,14,15,20,32,3,15,393
2890 DATA14,22,5,18,7,9,14,7,44,12,9,11,5,32,2,18,229
2900 DATA32,20,18,1,3,11,19,32,32,27,56,29,49,51,32,4,416
2910 DATA15,23,14,58,32,19,1,9,4,32,6,18,15,13,32,16,307
2920 DATA12,1,20,6,15,18,13,32,32,27,52,29,32,32,32,32,385
2930 DATA32,32,32,32,49,53,32,4,58,32,6,18,15,13,32,3,443
2940 DATA1,16,18,9,32,20,15,32,13,1,12,20,1,32,6,15,243
2950 DATA18,32,6,18,21,9,20,32,32,27,55,29,49,56,32,4,440
2960 DATA15,23,14,58,32,13,1,18,32,12,46,1,44,32,5,13,359
2970 DATA5,18,7,5,14,3,25,32,3,1,12,12,32,32,27,53,281
2980 DATA29,32,32,32,49,57,32,4,15,23,14,58,32,23,8,5,445
2990 DATA18,5,32,20,15,32,20,15,1,19,20,32,20,8,5,32,294
3000 DATA3,8,5,6,32,32,27,53,29,32,32,32,50,49,32,4,426
3010 DATA15,23,14,58,32,5,14,4,12,5,19,19,32,19,20,9,300
3020 DATA14,20,19,32,20,15,32,4,25,5,32,32,27,52,29,32,390
3030 DATA32,32,32,32,0,0,0,0,0,0,0,0,0,0,0,0,128
3040 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
3050 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
3060 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
3070 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
3080 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
3090 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
3100 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
3110 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
3120 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
3130 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
3140 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
3150 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
3160 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
3170 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
3180 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
3190 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
3200 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
3210 DATA0,0,0,0,0,0,0,0,0,0,0,0,9,14,3,1,27
3220 DATA18,3,5,18,1,20,5,1,3,3,12,1,9,13,21,14,147
3230 DATA2,21,18,4,5,14,3,15,13,1,20,1,19,20,5,18,179
3240 DATA1,23,12,1,20,5,18,1,14,11,19,9,14,20,15,19,202
3250 DATA5,5,4,3,8,9,14,1,20,1,14,16,9,3,1,7,122
3260 DATA5,14,4,1,5,3,8,15,9,14,5,4,9,2,12,5,115
3270 DATA14,15,20,1,2,12,5,16,1,18,5,14,20,8,5,19,175
3280 DATA5,19,6,1,19,20,1,19,12,5,5,16,1,3,5,19,156
3290 DATA3,1,4,5,20,5,13,21,14,5,21,20,18,1,12,9,172
3300 DATA19,5,1,18,4,5,14,20,3,1,14,1,19,20,1,18,163
3310 DATA5,3,12,9,14,5,5,22,1,16,15,18,1,20,5,4,155
3320 DATA20,1,4,16,15,12,5,18,5,3,5,9,16,20,20,9,178
3330 DATA13,5,13,5,1,7,1,20,5,14,1,2,19,5,14,4,129
3340 DATA32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,512
3350 DATA32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,512
3360 DATA32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,512
3370 DATA32,32,32,32,32,32,32,32,32,32,32,32,0,0,0,0,384
3380 DATA0,0,0,0,0,0,0,0,0,0,0,0,48,49,48,50,195
3390 DATA48,51,48,52,0,0,0,0,0,0,0,0,0,0,0,0,199
3400 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
3410 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,48,40,48,136
3420 DATA80,48,120,48,160,48,200,48,240,48,24,49,64,49,104,49,1379
3430 DATA144,49,184,49,224,49,8,50,48,50,88,50,128,50,168,50,1389
3440 DATA208,50,248,50,32,51,72,51,112,51,152,51,192,51,232,51,1654
3450 DATA16,52,56,52,96,52,136,52,176,52,216,52,0,53,0,0,1061
3460 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
3470 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,1
3480 DATA0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,1
3490 DATA0,0,0,0,0,1,1,0,0,0,1,1,0,0,0,0,4
3500 DATA0,0,0,0,0,0,0,0,0,0,0,0,13,13,13,13,52
3510 DATA13,13,13,13,13,13,13,13,13,13,13,13,13,13,14,14,210
3520 DATA14,14,14,14,14,14,14,14,14,14,14,14,14,0,0,0,182
3530 DATA0,0,0,0,0,0,0,0,0,0,0,0,165,54,37,70,326
3540 DATA133,86,21,86,37,102,245,102,85,118,181,118,21,118,37,134,1624
3550 DATA117,134,245,134,85,150,245,150,37,166,117,166,229,182,37,198,2392
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CROSSWORD

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3560 DATA37,54,69,54,101,54,133,54,181,54,213,54,245,54,21,54,1432
3570 DATA69,54,85,102,117,102,149,118,5,134,37,150,229,166,0,0,1517
3580 DATA0,0,0,0,0,0,0,0,0,0,0,0,11,18,26,55
3590 DATA30,36,39,42,47,51,55,60,63,66,72,76,84,91,102,112,1026
3600 DATA116,121,124,134,140,147,154,164,171,178,184,189,193,0,0,0,2015
3610 DATA0,0,0,0,0,0,0,0,0,0,18,33,58,4,122,4,239
3620 DATA214,4,232,4,26,5,52,5,112,5,124,5,136,5,186,5,1120
3630 DATA196,5,212,5,16,6,36,6,90,6,100,6,194,6,250,6,1140
3640 DATA42,4,46,4,50,4,54,4,60,4,64,4,68,4,72,4,488
3650 DATA78,4,32,5,36,5,120,5,214,5,42,6,114,6,0,0,672
3660 DATA0,0,0,0,0,0,0,0,0,0,0,11,7,8,4,30
3670 DATA6,3,3,5,4,4,5,3,3,6,4,8,7,11,10,4,86
3680 DATA5,3,10,6,7,7,10,7,7,6,5,4,3,0,0,0,80
3690 DATA0,0,0,0,0,0,0,0,0,0,0,64,65,66,68,263
3700 DATA69,70,66,68,69,70,66,68,69,70,66,68,69,70,66,67,1091
3710 DATA66,67,66,67,66,67,66,67,66,67,66,67,66,67,66,67,1064
3720 DATA66,67,66,71,64,72,64,73,74,75,64,73,74,127,0,223,1253
5000 PRINT"(CLR)NEW":PRINT"(DOWN)(DOWN)LOAD"+CHR$(34)+"1CROSS LOADS"+CHR$(34)+",1"
5010 REM CHANGE ,1 TO ,8 FOR DISK USE
5020 PRINT"(DOWN)(DOWN)(DOWN)(DOWN)RUN"
5030 POKE631,13:POKE632,13:POKE633,13:POKE198,3:PRINT"(HOME)"
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PROGRAM:1CROSS LOADS

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2000 FORL=0TO157:CX=0:FORD=0TO15:READA:CX=CX+A:POKE24624+L*16+D,A:NEXTD
2010 READA:IFA<>CXTHENPRINT"ERROR IN LINE";2040+(L*10):STOP
2020 NEXTL
2040 DATA74,75,64,73,74,75,64,73,74,75,64,72,64,72,64,72,1129
2050 DATA64,72,64,72,64,72,64,72,64,72,64,72,64,72,64,72,1088
2060 DATA64,76,66,86,80,87,66,86,80,87,66,86,80,87,66,85,1248
2070 DATA74,94,69,78,66,77,69,78,66,77,69,78,66,77,69,78,1185
2080 DATA66,77,69,83,69,78,66,84,64,72,64,72,64,72,64,72,1136
2090 DATA64,72,64,72,64,72,64,73,74,74,74,75,64,73,74,75,1128
2100 DATA64,73,74,75,64,73,74,75,64,73,74,74,74,75,64,72,1142
2110 DATA64,76,66,77,69,78,66,77,69,78,66,77,69,78,66,86,1162
2120 DATA80,92,80,87,66,86,80,87,66,86,80,87,66,85,74,82,1284
2130 DATA66,86,80,92,80,87,66,84,64,72,64,73,74,75,64,73,1200
2140 DATA74,75,64,73,74,75,64,72,64,72,64,72,64,72,64,72,1115
2150 DATA64,72,64,72,64,73,74,75,64,72,64,72,64,72,64,72,1102
2160 DATA64,76,66,86,80,87,66,86,80,87,66,86,80,89,69,83,1251
2170 DATA69,83,69,78,66,77,69,78,66,77,69,78,66,86,80,87,1198
2180 DATA66,77,69,83,69,78,66,84,64,72,64,72,64,72,64,72,1136
2190 DATA64,72,64,72,64,73,74,74,74,74,74,75,64,73,74,75,1140
2200 DATA64,73,74,75,64,72,64,72,64,73,74,74,74,75,64,72,1128
2210 DATA64,76,66,77,69,83,69,78,66,107,66,107,66,85,74,88,1241
2220 DATA80,81,74,82,66,86,80,87,66,86,80,87,66,77,69,78,1245
2230 DATA66,86,80,92,80,87,66,84,64,72,64,73,74,74,74,75,1211
2240 DATA64,72,64,72,64,73,74,75,64,73,74,75,64,72,64,72,1116
2250 DATA64,72,64,72,64,73,74,75,64,72,64,72,64,72,64,72,1102
2260 DATA64,76,66,86,80,92,80,87,66,77,69,78,66,86,80,87,1240
2270 DATA66,86,80,87,66,77,69,78,66,77,69,78,66,86,80,87,1218
2280 DATA66,77,69,83,69,78,66,84,64,72,64,72,64,72,64,72,1136
2290 DATA64,73,74,75,64,72,64,72,64,72,64,72,64,73,74,75,1116
2300 DATA64,73,74,75,64,72,64,72,64,73,74,74,74,75,64,72,1128
2310 DATA64,76,66,77,69,83,69,78,66,86,80,87,66,77,69,78,1191
2320 DATA66,77,69,78,66,85,74,94,69,91,74,82,66,107,66,107,1271
2330 DATA66,86,80,92,80,87,66,84,64,72,64,73,74,74,74,75,1211
2340 DATA64,72,64,72,64,73,74,75,64,73,74,75,64,73,74,74,1129
2350 DATA74,74,74,75,64,72,64,72,64,72,64,72,64,72,64,72,1113
2360 DATA64,76,66,86,80,92,80,87,66,77,69,78,66,86,80,87,1240
2370 DATA66,86,80,87,66,86,80,92,80,92,80,89,69,78,66,77,1274
2380 DATA69,78,66,77,69,78,66,84,64,72,64,72,64,72,64,72,1131
2390 DATA64,73,74,75,64,72,64,72,64,72,64,72,64,72,64,72,1102
2400 DATA64,72,64,73,74,75,64,73,74,75,64,73,74,75,64,72,1130
2410 DATA64,76,66,77,69,83,69,78,66,85,74,82,66,77,69,78,1179
2420 DATA66,77,69,78,66,77,69,83,69,78,66,86,80,87,66,86,1203
2430 DATA80,87,66,86,80,87,66,84,64,72,64,73,74,74,74,75,1206
2440 DATA64,73,74,75,64,73,74,75,64,73,74,75,64,73,74,74,1143
2450 DATA74,75,64,72,64,72,64,72,64,72,64,72,64,72,64,72,1101
2460 DATA64,76,66,86,80,92,80,87,66,86,80,87,66,86,80,87,1269
2470 DATA66,86,80,87,66,86,80,81,74,82,66,77,69,78,66,77,1221
2480 DATA69,78,66,77,69,78,66,84,64,72,64,72,64,72,64,72,1131
2490 DATA64,72,64,72,64,72,64,72,64,72,64,72,64,72,64,73,1089
2500 DATA74,75,64,73,74,75,64,73,74,75,64,73,74,75,64,72,1143
2510 DATA64,97,66,98,66,98,66,98,66,98,66,98,66,98,66,98,1309
2520 DATA66,98,66,98,66,98,66,99,80,100,66,99,80,100,66,99,1347
2530 DATA80,100,66,99,80,100,66,101,112,113,114,115,116,117,118,119,1616
2540 DATA120,121,122,123,124,125,126,127,128,129,130,131,132,133,134,135,2040
2550 DATA136,137,138,139,140,141,142,143,144,145,146,147,148,149,150,151,2296
2560 DATA160,161,162,163,164,165,166,167,168,169,170,171,172,173,174,175,2680
2570 DATA176,177,178,179,180,181,182,183,184,185,186,187,188,189,190,191,2936
2580 DATA192,193,194,195,196,197,198,199,32,32,32,32,32,32,32,32,1820
2590 DATA32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,32
```

```
,512
2600 DATA32,32,32,32,32,32,3
2,32,32,32,32,32,32,32,32,32
,512
2610 DATA32.32,32,32,32,32,3
2,32,32,32,32,32,32,32,32,32
,512
2620 DATA32,32.32,32,32,32,3
2,32,32,32,32,32,32,32,32,32
,512
2630 DATA32,32,32,32,32,32,3
2,32,32,32,32,32,32,32,32,32
,512
2640 DATA32,32,32,32,32,32,3
2,32,32,32,32,32,32,32,32,32
,512
2650 DATA53,32,1,3,58,32,18,
5,1,3,20,32,23,9,20,8,318
2660 DATA32,3,1,18,5,32,9,14
,32,12,15,3,11,32,21,16,256
2670 DATA32,32,27,49,49.29,3
2,32,49,49,32,1,3,18,15,19,4
68
2680 DATA19,58,32,32,1,16,16
,12,1,21,4,32,12,15,21,4,296
2690 DATA12,25,32,32,27,55,2
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,500
2700 DATA49,50,32,1,3,58,32,
15,6,6,32,12,15,1,4,32,348
2710 DATA1,14,4,32,2,21,18,1
4,32,14,21,4,5,32,16,8,238
2720 DATA15,20,15,19,32,27,5
6,29,49,51,32,1,3,18,15,19,4
01
2730 DATA19,58,32,21,14,14,1
,20,21,18,1,12,32,19,12,5,29
9
2740 DATA5,16,32,32,27,52,29
,32,32,32,32,32,32,32,32,32,
481
2750 DATA49,52,32,1,3,58,32,
1,18,20,32,19,5,20,32,2,376
2760 DATA18,15,11,5,14,32,21
,16,32,15,22,5,18,32,6,18,28
0
2770 DATA5,5,32,15,6,6,5,18,
49,55,32,1,3,58,32,2,324
2780 DATA18,15,11,5,14,32,12
,1,23,32,12,5,1,4,19,32,236
2790 DATA20,15,32,3,15,2,2,1
2,5,18,19,32,20,15,15,12,237
2800 DATA49.56.32.1.3.18.15.
19,19,58,32,32,3,15.14,19,38
5
2810 DATA21,13,5,4,32,32,27,
51,29,32,32,32,32,32,32,32,4
38
2820 DATA32,32,32,32.32.32.3
2,32,50,48,32,1,58,32,20,1,4
98
2830 DATA24.9,19.32.23.1,9.2
0,32,6,15.18,32.3,15,13,271
2840 DATA13.15,14,32,19,15,1
2,4,9,5,18,19,32,27,53,29,31
6
2850 DATA50,49.32,1,3,58,32,
9,14,22,5,19,20,9,7,1,331
2860 DATA20,5,32,2,21,20.32,
4,15,14,39,20,32,12,15,15,29
8
2870 DATA11,32,32,27.52,29,3
2,32,50,50,32,1,3,58,32,20,4
93
2880 DATA15.16,32,20,5,14,14
,9,19,32,19,20,1,18,32,9,275
2890 DATA14,32,20,8,5,32.4,1
8,1,23,32,32,27,52,29,32,361
2900 DATA50,51,32,1,3,58,32,
1,3,8,9,14,39,32,20,15,368
2910 DATA32,21.16,19,5,20,32
,20,8,5,32,2,5,19,20,32,288
2920 DATA3,18,15,3,11,5,18,2
5,50.52,32,1,58,20,8,9,328
2930 DATA19,32,7,5,14.20.32,
14,15,20,32,7.15,9,14,7,262
2940 DATA32,15,6,6,32.1,20.3
2,1,14,32,1,14,7,12,5,230
2950 DATA50,54,32,1,3,58,32,
14,15,20,32,2,1,12,4,32,362
2960 DATA9,6,32,2,12,1,3,11.
32,1,14,4,32,23,8,9,199
2970 DATA20,5,32,32,27,51,29
,32,50,55,32,1,58,32,20,8,48
4
2980 DATA9,14,7,19.32,20,15.
32,2,5,32,4.15,14,5,32,257
2990 DATA1,14,4,32,23,9,20,8
,32.1,7,5,32,27.54,29,298
3000 DATA50,57,32,1,3,18,15.
19,19.58,32,19,15,21,14,4,37
7
3010 DATA9,14,7.32,15,21.20.
32,20.8,5,32,4,5.16,20,260
3020 DATA8,32,32,27,52,29,32
,32,51,48,32,1,58.2,12,5,453
3030 DATA5.4,9,14,39.32,6,15
,15,4,32.9,32,3,15,15,249
3040 DATA11,32,9,19,32,14.15
.20,32,5.1,20,1,2,12,5,230
3050 DATA51,50,32,1,3,18,15.
19,19,58,32,2,5,14,20,32,371
3060 DATA39,1,12,15,32,9,19,
32,18,5,13,1,18,11,1,2,228
3070 DATA12,5,32,32,27,55,29
,32,51,51,32,1,3,18,15,19,41
4
3080 DATA19,58,32,8.5,32,19,
5,14,20,32,19,16,1,18,5,303
3090 DATA32,2,18,1,3,11,5,20
.19,32,32,27,49,49,29,32,361
3100 DATA49,32,4,58,12,9,20,
20,12,5,32,2,15,25,32,9,336
3110 DATA19,44,9,14,32,18,8,
25,13,5,32,8,1,25,19,20,292
3120 DATA1,3,11,27,52,44,54,
29,50,32,4,58,32,8,9,20,434
3130 DATA32,21,14,19,20,15,1
6,16,1,2,12,5,32,19,5,18,247
3140 DATA22,5,19,32,9,14,32,
3,1,19,5,32,32,27,52,29,333
3150 DATA51,32,4,58,32,20.18
,1,9,14,5,5,32,3,1,14,299
3160 DATA39,20,32,5,4,9,20,3
2,1,6,20,5,18,32,12,15,270
3170 DATA19.20,32.13,5.20,1,
12,52,32.4,15,23,14,58,32,35
2
3180 DATA18.5,13,21,14.5,18,
1,20.9,15,14,32,6,15,18,224
3190 DATA32.1,32,12,15,19.20
,32,2,9,18,4,32,27,51,29,335
3200 DATA54,32.4,15,23.14,58
,32,3.15,21,14,20.5,18,32,36
0
3210 DATA1,14,20,32,23,9,20,
8,32,19,16,1,18,5,32,20,270
3220 DATA9,13,5,32,27,49,48,
29,55,32,4,58,32,18,1,14,426
3230 DATA20,5,4,32,15,14,32,
1,2,15,21,20,32,2,5,9,229
3240 DATA14,7,32.16,1,19,19,
9,15,14.1,20,5,27,54,29,282
3250 DATA56,32,4,15,23,14,58
,32,3,1,14,39,20,32,19,8,370
3260 DATA21,6,6,12,5,32,1,19
,32,1,32,3,1,18,4,32,225
3270 DATA7,1,13,5,32,27.55,2
9.57,32,4,58,18,5,19,20,382
3280 DATA32,6,15,18,32,17,21
,5,5,14,32,23,9,20,8,32,289
3290 DATA16.15,9,14,20,12,5,
19,19,32,16.5,14,3,9,12,220
3300 DATA49.48,32,4,58,32.4,
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3310 DATA16,5,44,20,8,5.14,3
2,4,9,19,1,16,16,5,1,215
3320 DATA18,5,4,32,27,49,48,
29,49,53,32,4,15,23,14,58,46
0
3330 DATA32,1,16,20,32,4,15,
12,5,32,11,5,16,20,32,9,262
3340 DATA14,32,10,1.13,32,10
,1,18,32,32,27,55,29,32,32,3
70
3350 DATA49.54,32,4,58,13,9,
24.5,4,32,18,5,3,5,16,331
3360 DATA20,9,15,14,32,9,19,
32,14,15,20,32,15,14,32,20,3
12
3370 DATA9,12,12,32,18,15,12
,12,49,57,32,4,58,32,6,9,369
3380 DATA14,4,32,15,21,20,32
,8,15,23,32,17,21,9,3,11,277
3390 DATA32,9,32,3,1,14,32,1
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3400 DATA50,53,32,4,58,32,16
,18,5,3,9,15,21,19,32,19,386
3410 DATA20,15,14,5,32,6,9,1
2,12,19,32,8,15,12,5,32,248
3420 DATA9,14,32,6,5,14,3,5,
50,56,32,4,15,23,14,58,340
3430 DATA32,2,1,14,19,32,3,1
5,16,16,5,18,32,13,1,11,230
3440 DATA9,14,7,32,1,18,18,5
,19,20,32,32,27,52,29,32,347
3450 DATA51,49,32,4,58,32,14
,5,4,32,3,15,14,6,21,19,359
3460 DATA5,4,32,1,2,15,21,20
,32,20,8,5,32,3,15,14,229
3470 DATA3,12,21,19,9,15,14,
32,0,0,0,0,0,0,0,0,125
3480 DATA0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
3490 DATA0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
3500 DATA0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
3510 DATA0,0,0,0,0,0,0,0,0
,0,0.0,0,0,0,0
3520 DATA0,0.0,0.0,0.0,0,0.0
,0,0,0,0,0,0,0
3530 DATA0.0,0.0,0.0,0,0,0.0
,0,0,0,0,0,0,0
3540 DATA0,0.0.0,0,0.0.0,0.0
,0,0,0,0,0,0,0
3550 DATA0,0,0,0,0,0,0,0.0.0
,0,0,0,0,0,0,0
3560 DATA0,0,0,0,0.0,0,0,0,0
,0,0,0,0,0,0,0
3570 DATA0,0,0,0.0.0,0,0,0.0
,0,0,0,0,0,0,0
3580 DATA0,0,0,0,0,0,0,0,0.0
,0,0,0,0,0,0,0
3590 DATA0,0,0,0,0,0,0,0,0.0
,0,0,0,0,0,0,0
3600 DATA0,0,0.0,0,0,0,0,0,0
,0,0,0,0,0,0,0
3610 DATA4,0,0,0,0,0,0,0,0.0
,18,33,58,4,122,4,243
5000 REM ** READY FOR SAVE *
*
5010 PRINT "PRESS ANY KEY TO
 SAVE"
5020 GET K$:IF K$="" THEN GO
TO 5020
5030 POKE43,0:POKE44,54:POKE
45,3:POKE46,106:CLR
5040 SAVE "1CROSS",1,1
5050 REM CHANGE ,1,1 TO ,8,1
 FOR DISK
```

Allen Webb gives kernal routines and floating points the once over.

WELCOME TO THE MACHINE

BEFORE STARTING WORK this month, I want to plug two books which are invaluable to the machine code user. Both are by Nick Hampshire, Richard Franklin and Carl Graham:

1) *The Commodore 64 ROMs Revealed:* This is a fully annoted source code of the ROM contents and is the best I've seen.

2) *Advanced Commodore 64 Basic:* This gives an in-depth description of the functioning of Basic with a particularly good chapter on floating point operations.

From now on, as a matter of convention, I will signify the registers holding a 16 bit address as (low byte/high byte). For example, the routine at $AB1E which prints a string requires the start address in the accumulator (low byte) and in the Y register (high byte). In my short hand, this is represented by (A/Y). OK?

Kernal Routines

You may frequently want to LOAD or SAVE data to disk or cassette. There are kernal routines to handle both of these. Before SAVEing or LOADing, there are two other reoutines necessary to set up the file details. These are SETLFS and SETNAM.

SETLFS

This routine, called from $FFBA, sets up a logical file. It is called with the device number in the X register, the logical file number in the accumulator and the secondary address in the Y register.

SETNAM

This routine sets up the name of the file. It is called at $FFBD with the start address of the name in the X and Y registers and the length of the name in the accumulator. If you don't want to give the file a name, set the accumulator to zero before calling the routine.

These routines must be called before calling the SAVE or LOAD routines.

Load

This routine is called from $FFD5. The accumulator is set to zero if you want to make a load of 1 if you want to verify a file. If you have set the secondary address to zero when you called SETLFS, you must supply the load address in the (X/Y) registers. If the secondary address was one, the file loads to the address in its header.

Try these routines out, they work as they are with both disk and cassette.

As I will show later, it is possible to set up files in a neater way by use of routines in the Basic ROM.

Although the kernal has some handy routines, it is the Basic ROM which is the real mine of handy bits and pieces. Before I launch into this ROM, however, I must bend your minds with a little theory on the use of floating point.

Floating Point

Floating point representation is a complex system so I will only touch on the subject. We have already used eight and 16 bit integar numbers. The problem is, how do we represent decimals? The answer is in five or six bytes! When floating point numbers are being manipulated, the six byte unpacked system is used. When a number is being saved in RAM, a more efficient five byte packed format is used. The number is represented by four bytes which make up the mantissa. In packed format, bit seven of the most significant mantissa byte holds the sign bit. In unpacked format, the sign is kept in the extra byte. The final byte holds the exponent. The exponent decides the position of the decimal point.

If M1 represents the most siginificant byte of the mantissa and M4 the least significant byte, a floating point number is given by:

2(EXPONENT-129) * (1+((M1 AND 127)+(M2+(M3+M4/256) /256)/128)

If packed format is used, the sign is incorporated by multiplying that lot by:

(−1)↑(M1 AND 128)

See what I mean about complicated. It also explains why floating point operations are so slow! If you want to know more about it, try the books cited earlier.

The floating point routines use two floating point accumulators for storing data, FAC # 1 and FAC # 2. FAC # 1 occupies locations $61 to $66 inclusive ($61 is the exponent and $66 the sign) and FAC # 2 occupies locations $69 to $6E inclusive ($69 is the exponent and $6E the sign). Some other zero page locations are also used.

Just bear in mind what floating point numbers are for and we will look at their manipulation later.

I want to describe a number of handy routines for

Listing 1 shows a complete LOAD routine. The routine assumes that the device is stored in location DEV, the filename is stored in RAM starting at address BUFFER and the name length is in NAMELEN. The secondary address is set to one.

Listing 1

```
10  LOAD LDA # 1        ; logical file number
20  LDX DEV             ; device
30  LDY # 1             ; secondary address
40  JSR $FFBA           ; set logical file
50  LDA NAMELEN         ; name length
60  LDX # <BUFFER       ; name least significant byte
70  LDY # >BUFFER       ; name most significant byte
80  JSR $FFBD           ; set file name
90  LDA # 0             ; we want to load
100 JSR $FFDS           ; perform load
110 RTS
```

Save

This routine is called from $FFD8. Rather more information is required before RAM can be saved. We need to know the start and end addresses of the block of RAM. This is achieved in quite a neat way. The start address of the block is stored in a pair of zero page locations in the usual low/high format. The accumulator is loaded with the low byte of this pair. The end address plus one is stored in (X/Y) and the routine called. Listing 2 saves a block of RAM from address SA to address FA. The basic assumptions are as in listing 1.

Listing 2

```
10  SAVE LDX DEV        ; device number
20  LDA # 0             ; logical file number
30  LDY # 0             ; secondary address
40  JSR $FFBA           ; set logical file
50  LDA NAMELEN         ; name length
60  LDX# <BUFFER        ; name least significant byte
70  LDY# > BUFFER       ; name most significant byte
80  JSR $FFBD           ; set name
90  LDA# < SA           ; start adress 1sb
100 STA $BA             ; into location $BA
110 LDA# > SA           ; start address msb
120 STA $B5             ; into location $B5
130 LDA # $B4           ; location holding start address 1sb
140 LDX# < FA           ; end address 1sb
150 LDY# > FA           ; start address msb
160 JSR $FFD8           ; perform save
170 RTS
```

the conversion of integer and floating point numbers.

First, their are three routines which will convert a floating point number in FAC # 1 to an integer. They accept integers in various ranges:

$B1AA

This routine takes a floating point number in the range -32767 to 32767 and converts it to an integar in (A/Y).

$B1BF

This routine takes a floating point number in the range zero to 32768 and converts it to an integer in ($61/$62).

$B7F7

This routine takes a floating point number in the range zero to 65535 and converts it to an integer in ($14/$15).

$BCCC

If you want to perform the equivalent to INT, this routine converts FAC # 1 to an integer and then refloats it into FAC # 1.

$B391

Converts an integer in the range 0 to 32767 in (Y/A) to a floating point number in FAC # 1.

$BDDD

Converts the value in FAC # 1 into a string terminated by O and returns with the start address of the string in (A/Y). This is the same format as the print string routine at $AB1E. To print a floating point number in FAC # 1, simply use:

```
JSR $BDDD
JSR $AB1E
```

A routine at $BDD7 does htis in one go thereby saving three bytes.

$B7B5

This routine performs a function similar to VAL in that it converts a string starting at ($22/$23) and length in the accumulator to a number in FAC # 1

OK, that's all for this time. Next month I'll continue with the Basic ROM and discuss how to pass parameters to machine code.

Listing 3

```
10 *=$C000
20 FLAG = 1000
30 LDA #0
40 STA FLAG              ;CLEAR FLAG
50 START JSR $FFE4       ;SCAN KEYBOARD
60 BNE OUT               ;KEY PRESSED
70 LDA FLAG              ;CHECK FLAG
80 BEQ REV               ;FLAG=0
90 DEC FLAG              ;ZERO FLAG
100 LDA #146             ;TURN OFF REVERSE FIELD
110 JSR $FFD2
120 JMP PMESS            ;PRINT MESSAGE
130 REV INC FLAG         ;SET FLAG TO 1
140 LDA #18              ;SET REVERSE FIELD
150 JSR $FFD2
160 PMESS LDX #20
170 LDY #7
180 CLC
190 JSR $FFF0            ;SET CURSOR POSITION
200 LDA #<MESSAGE
210 LDA #>MESSAGE
220 JSR $AB1E            ;PRINT MESSAGE
230 JMP START            ;BACK TO START
240 OUT RTS
250 MESSAGE .ASCI "PRESS ANY KEY TO CONTINUE"
260 .BYTE 0
```

Homework To Part 7

Last month's homework was a mixed bag. Question 1 asked you to provide a routine prompting for a key press. Here is one solution:

In order to save space, the routine uses just one message with FLAG deciding whether or not the message is written in reverse field. You should recognise all the ROM calls from earlier parts of the series. The odd flashing effect is due to interference between the flash and the screen scan. Press CTRL to see the effect of introducing a delay to slow down the flash rate.

Questions 2 and 3 were

Listing 4

```
30 *=$C000
40 START = $FB
50 FINISH = $FD
55 CHARADD = $FB
60 ;
61 JMP SETUP
62 JMP SCROLL
70 SETUP LDA #$00          ;SET UP START AND END ADDRESS
ES
80 STA START
90 STA FINISH
100 LDA #$D0
110 STA START+1
120 LDA #$30
130 STA FINISH+1
140 LDA $DC0E              ;TURN OFF INTERRUPTS
150 AND #254
160 STA $DC0E
170 LDA $01
180 AND #251
190 STA $01
200 LDY #0
210 LOOP LDA (START),Y ;MOVE CHARACTER TABLE TO $300
0
220 STA (FINISH),Y
```

```
230 CLC                 ;BUMP ADDRESS
240 LDA START
250 ADC #1
260 STA START
270 LDA START+1
280 ADC #0
290 STA START+1
300 CLC
310 LDA FINISH
320 ADC #1
330 STA FINISH
340 LDA FINISH+1
350 ADC #0
360 STA FINISH+1
370 LDA START           ;FINISHED PRINT
380 BNE LOOP            ;NO - NEXT BYTE
390 LDA START+1
400 CMP #$D4
410 BNE LOOP            ;NO - NEXT BYTE
420 LDA $01             ;YES - REINSTATE INTERRUPTS
430 ORA #4
440 STA $01
450 LDA $DC0E
460 ORA #1
470 STA $DC0E
480 LDA $D018           ;ACTIVATE NEW CHARACTER SET
490 AND #240
500 ORA #12
510 STA $D018
520 RTS
530 ;
540 ;
550 SCROLL JSR $AEFD    ;GET CHARACTER NUMBER
560 JSR $AD8A
570 JSR $B7F7
580 LDA #0
590 STA CHARADD+1
600 LDA $14
610 STA CHARADD         ;CHARACTER NUMBER TIMES 8
620 ASL CHARADD
630 ROL CHARADD+1
640 ASL CHARADD
650 ROL CHARADD+1
660 ASL CHARADD
670 ROL CHARADD+1
680 CLC
690 LDA CHARADD+1
700 ADC #$30            ;ADD START ADDRESS OF CHARACT
ER TABLE
710 STA CHARADD+1
720 LDY #0
730 LOOP 1 CLC          ;ROLL FIRST BYTE
740 LDA (CHARADD),Y
750 ROL A
760 BCC LOOP2           ;WAS A SET BIT ROLLED INTO CA
RRY
770 ORA #%00000001      ;YES,REPLACE IT
780 LOOP2 STA (CHARADD),Y
790 INY
800 CPY #8              ;FINISHED PRINT
810 BCC LOOP1           ;NO - NEXT BYTE
820 RTS
```

linked and involved redefined characters.

SYS 49152 moves the character set to $3000 and initialises the new set. SYS 49155,X rolls the character X left one pixel e.g. to scroll A, use SYS 49155,1.

I'm feeling generous this month so there's only one question for your homework.

Imagine that you are writing a simple adventure interpretor and that you have a table of the first four letters of each word in a vocabulary. For example:

TAKELOOKEATSINGTHRO...

Words less than four letters long are padded with spaces (chr$(32)).

I want a simple routine which does the following:

1) Prompts and inputs a string.
2) Takes the first four characters of the input and searches the table for a match.
3) If a match is found, a friendly message tells you of the position of the word in the table.
4) If no match is found, a message advises you accordingly.
5) The table may be limited to 256 characters (64 words).

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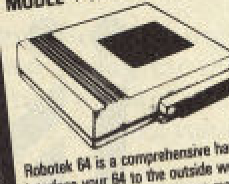
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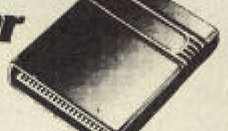
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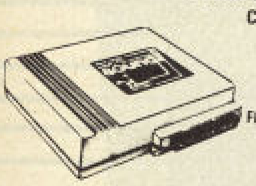


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BATTERIES INCLUDED

Eric Doyle looks at some new utilities from Canada — courtesy of Ariolasoft.

I'VE HAD AN INCOMPATABILITY PROBlem between my 64 and printer for the past three or four years. The 64 works happily to its 40-column screen but my printer produces 80 column printouts.

My wordprocessor is my bread and butter, and each month I face the same problem of formatting my artful prose into an intelligible document by switching from a 40-column composing screen to the double sized output screen and then scrolling back and forth 'windowing' my way around the pages. Then I have to turn back to my (de)composing screen to make any changes. I often think how nice it would be to have an 80-column screen and avoid this daily chore.

Of course there are ways around this problem such as using the Tasword wordpro which redefines characters to force a pseudo 80-column screen on to the normal Commodore screen but I also need a jumbo-sized database and spreadsheet screen.

After obtaining a copy of the excellent PaperClip wordpro and Consultant database, I noticed that the originating company, Batteries Included of Canada, had many other superb products. This fact has not escaped the ever watchful talent scouts of Ariolasoft and the result is the appearance of the B1-80 adaptor in the Ariolasoft catalogue.

Used with the 1701 and 1702 Commodore monitors, this 80-column adaptor slots in a 6545 video processor and Basic v4.0 Disk Operating System into 8K of memory from \$8000 to \$9FFF. Existing software has to be adapted to fit the 80-column format and skirt around the essential screen operating system. As far as I can see this means using Batteries Included products at the moment but that's probably a plus if you haven't already shelled out for a wordprocessor.

Installation is simplicity itself. Pop the unit into the cartridge port and connect the monitor using easy-to-follow instructions and supplied adaptor leads. In a matter of minutes your 64 is ready for crystal-clear, 80-column, monochrome working.

One major advantage over the 64's big, little sister is that switching from 40 to 80, and back again, is achieved by a SYS command thus avoiding the hoohah normally associated with the 128's composite/RGB outputs. Using the SYS within a program is permissable but although I had no problems in switching in the 6545 processor and operating system without clearing its associated screen RAM, going in the opposite direction always resulted in a blank 40-column screen.

I found no real problem in using either PaperClip or The Consultant on the wide screen even though I was not using either of the standard Commodore monitors. Trying it on the CBM 1701 the picture appeared even sharper.



Another problem I have with my printer is the self-imposed one of linking a Centronics machine to my 64 in preference to the descenderless Commodore models. To get a good listing to print in PETSCII code on an ASCII printer requires an adaptor. Once more the Ariolasoft/Batteries Included link-up rushes to the rescue with BI Interface.

The attachment is a little messy because the unit attaches to the serial port and taps a power supply from the cassette port which means that the printer adaptor dangles off the back of my computer by two leads. A third lead then trails off to my printer. This is made even worse because I also use a disk drive on the serial port, so the lead to the adaptor has to stretch across to the daisy-chaining output from my 1541 to allow the disk drive to be linked into the system. Aesthetically this is unpleasing but it is a common problem with most similar adaptors so you just have to get used to the idea or do as I do. By raising the computer on wooden wedges you can tuck the unit under the body of the 64 and out of sight.

Cassette-based system users may be throwing their hands up in horror at the thought of sacrificing their cassette port for a mere power tap. I'm pleased to say that the back of the plug has a duplicate cassette connector so that both units can be used in tandem with no ill effects.

Once installed a few switches have to be set according to the type of printer on the other end. You can opt for the usual device number four or select five if another printer, such as a daisywheel, is linked into the system. A second switch controls the PETSCII/ASCII converter which I'll explain in a minute. The third switch acts as a CAPS lock and the final switch will add line feeds for those printers which fail to recognise 'return' commands.

The converter switch does not actually send out the various graphic symbols of the PETSCII code but converts these to the kind of abbreviations which are found in the Basic listings in Your Commodore. For example, the reversed Q which, symbolises a cursor down, CHR\$(17), will appear as DWN in brackets. This has two advantages, the adaptor will work on a wider range of ASCII compatible printers and the listings produced are clear and

unambiguous. Some of the abbreviations could be better but you get used to what you're given!

Gathering dust in a cupboard, I have a 4040 dual disk-drive which would simplify disk backup procedures. OK, I can struggle along with two 1541s but I need a special program which always means slowing down the duplication process. The v4.0 DOS has useful commands like BACKUP which can only work on the older dual systems because all 1541s have a drive number of zero and these commands work on drives with number zero and one. Hence the insistence on using a drive number with disk commands on the 1541 when this is rarely necessary because the default value is zero. More a case of syntactic good practice than necessity.

Off the hobby horse and back to the the lead can be left in place, even when the interface is removed. Apart from this increased flexibility to your system you also get v4.0 DOS to enable you to use it to best advantage.

Before I leave the new Ariolasoft range I would just like to give a plug for the aforementioned software packages which, for my money, give the best value available.

PaperClip is available for 40-column C64s and 80-column C64s and C128s, allowing printouts up to 250 columns wide. All three versions appear on the same disk so no upgrading problems there. A dongle to plug into your joystick port comes with each pack sold which at least means that you can back up your disk easily.

What you get for your money is a wordprocessor which approaches perfec- the production of form letters and associated address files is a boon to mailshots. For the uninitiated, a form letter is one in which the text remains the same but names, addresses and any other nominated details are read in from a file to customise or personalise what would otherwise be a general circular.

Other wordpros look at text blocks as page width chunks but PaperClip can select vertical sections of any width so that tables of figures can easily be moved or transposed with the minimum of fuss. The columns can even be sorted into alphabetical or numerical order without leaving the program!

Adding to this full printer control, the ability to pause to change a daisywheel with a screen message to say which one, the ability to produce linked, or global, files and you have a very useful tool rather than a glorified typewriter.





review. The third BI product is called BusCard II and it allows the cartridge port to interface with Centronics or IEEE-488 equipment. Earlier CBM machines relied heavily on the IEEE connection and many bargains can still be found in secondhand outlets. The interface has three outputs; the normal cartridge port connector, a parallel output and the IEEE Bus. System conformation is determined by a bank of eight switches allowing communication with a total of seven devices numbered four to 10.

Connection of the BusCard necessitates delving into the innards of the 64 to find the R44 resistor to which a clip is connected. Although the instructions go out of their way to describe accurately where the connection point is, the words fail to hit the mark. Terms such as 'right' and 'bottom' are subjective and rely upon your viewpoint and conception of these terms. In their unending quest for clarity, BI include two unambiguous photographs to clarify any doubt that the verbal description may leave. Nice try but the important area of these photos is so dense that any detail is lost in a black blur.

Once the connection has been made tion even though by state-of-the-art standards a few improvements could be made.

For example, pop-up menus and attention to irritating features would help. This includes the fact that pressing the 'return' key halfway along a line erases the rest of that line. Normally this is something you can get used to but after a long night it can have disastrous results. Here speaks the voice of experience! Early one morning while writing another gem for Your Commodore (editor please note my plea for overtime!), I decided to amend an earlier piece of text which I had written. Next morning, or later that day, I discovered that I'd fallen asleep at the keyboard, my hand had rested on the 'return' key and effectively erased a substantial portion of text. Luckily, I'd saved to disk recently so no major harm was done but I couldn't help wondering 'What if?'.

Apart from all of the usual facilities such as search and replace, text block movement, appending files and so on, the program has many extra facilities which raises it way above the rest. The ability to define commonly used phrases as a variable can save a lot of typing time and

The Consultant is perhaps not as revolutionary but its main advantage is that it is very easy to build up a database from scratch. User friendliness is not something I associate with this branch of file management but I have no complaints with either the 'base development or the report creation systems in this package.

Multipage records add to the flexibility of information storage and retrieval. Once your base is established, you can even produce a file suitable for form letter creation for use with PaperClip.

One area I've not covered with any of these products is the one of cost. Really it all depends on what you want from your system. For the home-user PaperClip's facilities would lie dormant and 80-columns would be an expanse which could be avoided. For the professional or serious user it's all a matter of need. One thing I will say is that any of the products are worth examining but the peripheral interfaces are in a highly competitive market where costs and facilities can vary widely.

My only regret is that I now have to pack everything away and return it. Hope the Editor's got a crowbar to release my grip on these goodies.

-COMPETITION-COMPETITION-COMPETITION-COMPETITION-COMPETITION-COMPETITION-COMPETITION-

COMPETITION

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All offices must arrive at the Your Commodore office not later than first post on Friday 26 October 1986.

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On the back of your envelope you should write the number of each of your question with your answer beside it.

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   ....

2. History
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   ....

3. Art and Literature
   Who was the author of the Hobbit?

   ....

4. Sport and Leisure
   Name three sportsmen whose names have been used in the titles of Commodore games.

   1 ....

   2 ....

   3 ....

5. Entertainment
   Which artist recorded the hit song from the film Ghostbusters?

   ....

6. Science and Nature
   What is the decimal equivalent of the binary number 11001010?

   ....

Please complete the following:

Name ....
Address.................................
....
....
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Please send your entries to: Trivial Pursuit Competition, Your Commodore, 1 Golden Square, London W1R 3AB. Closing date: Thursday 23 October 1986.

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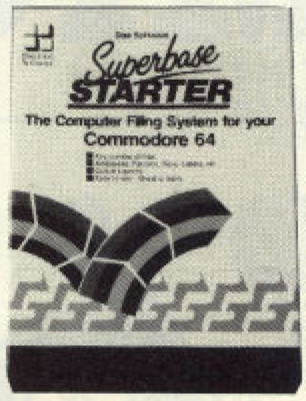
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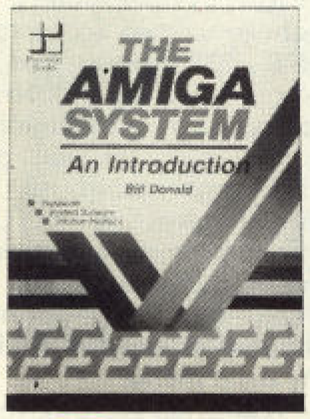
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MICRO FILE 64

Gareth Thomas

updates Microfile 64

THE MICROFILE 64 PROGram published in the June '86 issue of Your Commodore did not have a printer option since I had no access to a Commodore printer.

After publication I did manage to gain access to an MPS 801, albeit for an evening, and was able to add the necessary programming.

The program will print from any record to any record, pressing RETURN when prompted to enter these records will cause the whole file to be printed. Entering -1 will exit back to the main menu.

A title may also be given to the printout, eg. date and the printing can be stopped by pressing 's'.

All alterations and new lines are displayed in Figure 1. Line 3526 allows you to print records from the latest search by pressing 'p' on the search screen.

Corrections

As well as this routine a number of errors has also be found since publication, Figure 2 lists all the changes that need to be made.

A couple of addresses were also printed incorrectly in the magazine these are:

1) Interrupt driven routine ($CA43 – $CAA7)
2) Input routine ($CAA5 – $CB45)

This should clear up any problems that you may be having with the program.

figure 2

```
corrections to main peogram


3625 gosub 9800:printtab(5)"[up]*
*[rvson,spc,sn]o data found[spc,rv
soff]* *":is=0:gosub 3900
3798 if s$=mid$(a$(si,g),s,ln)then
cp$=cp$+chr$(g):ps=s

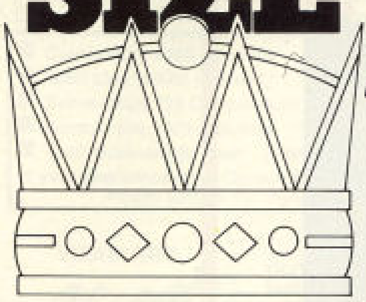

corrections to format program

290 if (y/8)-6<0 or(x/8)-3<0 then
i=i-1:goto240
```

figure 1

```
  35 onw+1gosub6000,100,6100,1800,
2500,3100.3500,8000,4490,5825
3505 "[down,right,yellow]'E'-exit
'C'-clear 'V'-view 'P'-print [down
2]"
3526 ifs$="p"andcp$<>""then print"
[clear]":ef=1:gosub 6140)
[clear]":ef=1:gosub6140
3527 ifs$=""orlen(s$)<3 then 3500
6105 sr=0:er=0:sysat,0,4:print"Ent
er -1 to exit." for whole file."
6110 sysat,8,7:input"Start record"
;sr:ifsr=0thensr=1
6111 ifsr=-1then return
6115 ifsr>rc-1thengosub9800:goto61
30
6130 sysat,8,10:input"End record";
er:ifer=0thener=rc-1
6131 ifer<=-1then return
6135 ifer<sr or er>rc-1thengosub98
00:goto6130
6140 sysat,1,13:input"Do you wish
to title printout(y/n)";q$
6150 ifq$="n"thent$="":u$="":goto6
175
6160 ifq$<>"y"then 6140
6170 sysat,1,16:input"Enter title"
;t$:foru=1tolen(t$):u$=u$+"[c T]":
next
6175 sysat,8,19:print"press's'to [
RVSON]stop[RVSOFF]":gosub9800
6180 open1,4,7
6190 print#1,t$:print#1,u$:print#1
6195 ifefthenef=0:fori=1tolen(cp$)
:p=asc(mid$(cp$,i,1)):gosub6200:ne
xt:goto6197
6196 forp=srtoer:gosub6200:next
6197 close1:return
6200 print#1,"[RVSON] Record "p:pr
int#1:ford=0tofd
6205 print#1,"  ";b$(2,d);": ";a$(
d,p)
6210 getg$:ifg$="s"thenp=er:d=fd:n
ext:goto6230
6215 next:print#1
6220 print#1,"                    -
 - - - - - - - - - - - - - - - - -
 - - "
6230 return
```

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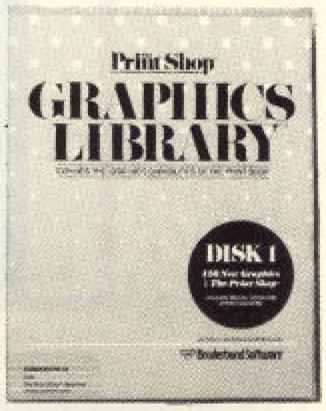
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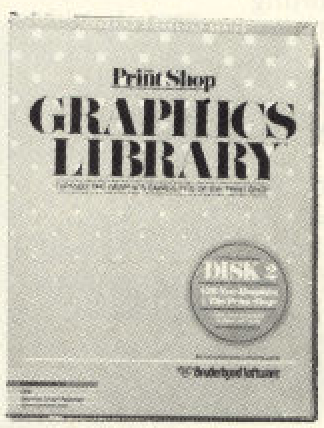
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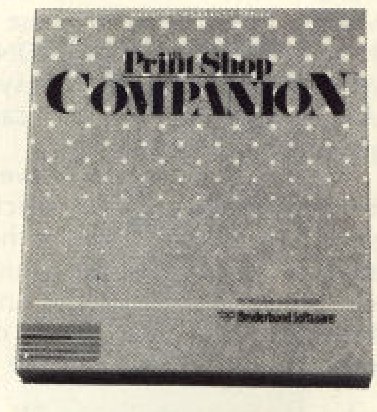
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MACH 6

Steve Carrie answers some of your queries about his Mach assembler series.

SINCE THE PUBLICATION OF MY Mach Assembler system, several people have written into the office reporting various bugs. Most of these problems have occurred with the MONITOR and MACRO sections of the system, the ASSEMBLER is so far causing no problems.

Some of the letters I have received, have reported problems which have not shown up on my version of the system. I suspect that (due to the lack of checksum error checking on the Basic listings) these have been caused by mistakes during entry of the program.

The Monitor

I'll deal first with the MONITOR. The TTY command seems to be causing problems (again). It would seem that it will not work correctly with disk-orientated commands. I'm afraid that, without a complete rewrite of the program, nothing can be done about this. TTY will still work with M,R and other non-disk commands (and also with the D command of the Mach 4 extension). If you require a listing of your source code, I suggest that you exit to Basic and simply LOAD and LIST the program to the printer since the Mach 1 editor uses the same area of memory and the same format as a normal Basic program.

OK, first the TTY command. Below is a reprint of the Mach 5 printer alterations which first appeared in the April issue of Your Commodore. In addition to this, an extra change (address $8460) is included to prevent the excessive linefeeds during printer list. Note that the changes originally included for the Assembler are not shown here since the assembler accesses the disk drive, it will not allow the assembly listing to be sent to the printer. Make the changes in the order shown.

Use the M function of the MONITOR to alter the following:

8891 should be 04
889D should be 04
88A2 should be 04
8460 should be 4C
88A4 should be 00

Next, change the following sequence of bytes:

address 8E80 20 23 87 AD AF 02 F0 05 EA EA 20 A8 8E 60 20 12 87 4C 83 8E
address 9EA0 20 A8 8E 6C 02 03 00 00 A2 04 20 C9 FF A9 04 85 9A 60
address 89E2 20 80 8E
address 8A4A 20 8E 8E
address 88B5 4C A0 8E
address 887E EA EA 4C A8 8E

Now save the MONITOR as follows:

S MON 8200,8F00 for original version.
S MON 7D00,8F00 for the extended version (Mach 4).

The Macro

Now for the MACRO processor. Firstly, the save addresses given originally were, I think, incorrect. The save option is:

S MACRO 9000,9C40

First load and run the MONITOR. Now exit to Basic and rerun the original Basic listings of the Macro Processor.

Now the .SER bug can be solved by setting the byte at address 98F9 to 60 (hex). Further improvements can be made by setting the following sequence of bytes at address 92D6.

address 92D6 A8 99 40 03 C8 C0 D0 F8

Now you can save the Macro Processor using the above S command.

This should correct the MACRO problems.

Some of the letters received asked specific questions and the section that follows attempts to answer them.

The MONITOR DIR command will list the directory of any 1541/1570 formatted disk (unprotected).

The HEX and DEC commands were originally included to allow the user to enter the display data in either HEX or DEC format. Both should work the same (apart from the said formats) and return to the > prompt.

Some printing errors did occur in the original series of articles (like missing # off > / <).

The M command will display only eight byte values per line in HEX or DEC mode.

EPROMing this series of programs would probably require a rewrite and since a better version has now been written I doubt it would be a good idea.

I don't think that the legendary bug in the early 64 ROM will affect the system.

I think I've covered just about everything, however if anyone has any further problems with this system, then write to: Steve Carrie, 33 Elm Hill, Arbroath, Tayside, Scotland DD1 4ES.

I would like to thank everyone who wrote to me: W Reynolds, Strathfoyle, County Londonderry; G Roberts, Buckley, Clwyd; T Chivers, Ely Cambridgeshire; R Rice, Romford, Essex; Yuan Fuat Chin, Kingsford, NSW Australia; R Parr, Portsmouth; D Brown, Kilmarnock, Ayrshire and Jim Wiseman, Darlington, County Durham.

COMMUNICATION CORNER

David Janda brings you more news and views from the communications world.

FIRST OFF, REMEMBER A COUPLE OF months ago I previewed the *Voyager 7* modem from Modem House, together with the new *Mustang cartridge* from Y2 Computing? Well in the preview I mentioned that I couldn't get the Voyager to auto-answer. It transpired that the model they sent me hadn't got an auto-answer board in it, neither have any *Voyager 7s* with a serial number less than 1200. If you have a Voyager that doesn't auto-answer then send it back to Modem House says MH's Keith Rose. Keith is also at pains to point out that the basic price of the Voyager does include auto-answer as standard.

I was to have reviewed Y2 Computing's Bulletin Board software this issue, but the editor (bow) and myself haven't managed to get down to Y2's HQ. But according to Andy Waller, who runs the Soley Sixty Four area on Micronet (which has now moved to *600110) its very nice indeed. £69 inc. VAT and p&p gets you a very comprehensive scrolling type BB package which can be used on the 64 or C128 with a single disk drive. Andy has managed to tweak the package a bit so it operates in Viewdata format, and he has set up a BB to demonstrate it (0522-689324, 10PM-8AM, 1200-75 Viewdata). Y2 also has a demonstration board which show off the packages features (0923-50161, 7PM-9AM, 1200-75 scrolling).

Micronet

The big news this month is all about MUD (Multi User Dungeon). Micronet's mega-star PR person Peter Probert informed me about this new development a day before going to press. Details are scarce, but here they are. The game should be up and running by the end of July in which case you may have already played it! The game itself is called *Shades* and is based on the original Essex MUD. When implemented on Micronet it will be open access to all Micronet subscribers; there'll be no extra subscription charge or anything like that. The game will be run on a PDP-11, and I am informed that converting it to run in Viewdata mode is a major achievement. No extra link software will be needed to play the game as is the case with Compunet MUD, yet there will be split-screens with current text displayed in Blue, and previous in Cyan. There will also be the ability to view past text.

Two key features make Micronet MUD rather interesting – capacity and price. Up to 64 people will be able to play simultaneously, which is double the norm. As far as price is concerned Micronet MUD will cost just 99p an hour all inclusive! Compared to Compunets MUD which costs £1.76 per hour (ex. VAT), it would appear that Micronet MUD is exceptionally good value for money.

Turbo Chat (*811411) has been improved to accommodate the four messages per page. It was still in development stages at the time of writing and is being offered free to users whilst on the development stage.

Compunet

If you are not a subscriber to Compunet then why not? I have been informed by acting editors MN1, APB1, DM8 and PD10, who are the business boys behind the HHGTTG area at 149682 that the Hitch Hikers Guide To The Galaxy directory is the best new dir on Compunet. Does this merit a special investigation by Communication Corner? Is it the best thing next to sliced bread? Would it interest Marvin? Citizens I haven't got a clue! So why don't you find out yourself.

Now the important stuff is out of the way, on with the drivel.

First, alphanumeric GOTOs. I know I have mentioned these before, but now they have been in operation for a month it's worth commenting on how effective they are. Before, to GOTO a particular area of interest you had to enter the page where the director was. Now areas of interest have a name rather than a number associated with them. Names are easier to remember and it has 'opened up' Compunet. GOTO NEWS, MEGA, COMMS and so on is so much easier!

Federation II, the multi-user space adventure from Compunet is well under development. Al Lenton at Compunet informed me at the time of writing that 800 locations had been written so far. No specific date has been set for when it will be on line to all but late Autumn was mentioned. I have a little more news on the Telex front. Compunet intends to offer Telex facilities around the end of August. To the best of my knowledge entering a Telex will be as easy as using the CN Courier system, and the cost for a UK Telex should be around 50p.

OK, things to look out for on Compunet are: GOTO DEMOS, 'a whole new art form' as editor Jane put it. Music fans must not miss some excellent stuff at GOTO WE and Chess fans should. GOTO CHESS. Finally, GOTO of the month as far as I am concerned is the ICPUG area. Dave Martin (ID: DM87) does a lot of work in this area as well as Mega Scene (GOGO MEGA).

That's all folks! Next month a look at the Y2 BB (I hope), a feature on a couple of Commodore run BBs plus info on a public domain BB system from Canada!

I can be reached on the following systems: Telecom Gold 72:MAG95307, Compunet D.JANDA and One-To-One 13419001.

CREATIVE INCENTIVES

We review the Adventure Creator from Incentive Software.

AT LONG LAST, YOU HAVE FINISHED your masterpiece. The plot is better than Lord of the Rings and the problems would baffle even Sherlock Holmes. The only snag though is that you haven't got a clue about programming and it looks as if you will never be able to convert your ideas from paper to computer. Fear not though. Like all the best stories, this one has a happy ending. For there over the horizon, like a knight on a white charger, is the latest utility package from Incentive – the *Graphic Adventure Creator*.

Written originally for the Amstrad (when it received rave reviews) the package allows you to turn your game into a professional looking product with quickly drawn pictures to accompany your text if you so desire. You can also market your product without having to pay any licensing fee to the authors although they do ask you to give them a plug somewhere in the game. Be warned though. You will not be able to sit down in front of your machine and start earning lots of money just like that, there is an awful lot of preparation to be done first.

The main program – the creator itself – consists of a menu of various options available to you. From here you can define lists of words that will be "understood" by the program, save and load files, draw pictures and describe your locations etc. Before you start doing any of this, it is advisable to have a labelled map of your story complete with notes about the location of objects and details of the various problems to be solved in the game. The reason for this is nothing more sinister than that the logic behind creating an adventure is so complex, you simply will not be able to remember it all.

I found that it was easiest if I started off by entering all my location descriptions. This gave me a handy framework to use when I started moving objects about and playing about with logic conditions. Each location is called a room although it can be anything that you want from a planet to a matchbox. Descriptions can be up to 250 characters long which seems more than adequate as at this stage you have not yet described the exits or objects present. You are prompted in turn for the room number, its description, exits and picture associated with it (if any). You can also have as many rooms as you want up to a maximum of 9999. The only thing that holds you back is lack of memory and it is up to you to balance the size of the game against the amount of detail you require. You start off with just over 23K to play with although there is a fair bit of data compression done by the program.



You should now think about creating lists of verbs and nouns that the program will understand. It is worth while loading the "Quick Start" file at this stage as it contains lists of the most commonly used words as well as some essentially system messages that must be included in the game. These can be edited as you see fit although you must keep the meanings the same. This allows you to give your games a more personal touch – they won't keep coming up with the same messages as everybody else who has used GAC. Your list of verbs is simply entered. Assign each new word a unique number and that is all there is to it. If several words have the same meaning, then you give them all the same number. For example, you might want "kill", "attack" and "hit" to mean the same thing and so you create verb number 20 three times over, one for each of the synonyms.

Any messages that you want to appear in the text are similarly created. Nouns and objects are treated slightly differently though. A list of nouns is created as before but any variation in the form of a particular noun has to go on to the objects list. For example, assume that you want a bucket in your game so you define the noun bucket. In the object list, you then further define this as a bucket of water and an empty bucket – the two forms that the bucket will take within the game. Objects have to be given the room number in which they appear.

Any object which has not yet put in an appearance or is to be removed from the game is assigned to room zero, a mythical location controlled by the program. To continue our example, you can set up the bucket of water in room 1 and the empty bucket in room zero. Then when the player empties the bucket, you simply get the program to swap the objects so that the empty bucket is now in room 1 and the bucket of water removed to room zero. Objects can also be assigned a weight or cost if you want to include those particular features in your game.

The program features a 785 word



vocabulary with several advanced features. These include the ability to understand "it" – as in "take the book and burn it" – as well as distinguishing every single word and not just the first four letters as in most similar programs. The parser can also cope with adverbs (open the chest carefully) and adjectives (get the iron key).

Once you have described all your words and rooms (and it is really very simple to do so once you have got the hang of it) you are ready to get involved in the nitty gritty of designing your adventure, namely putting in the logic. This is done by establishing a set of conditions and at first appearance, looks extremely daunting. It still looks that way at second and third appearance so take the time to sit down and re-read the instruction manual very carefully. The conditions are structured into three tiers – high priority, local and low priority. High priority involves things like whether you are dead and this is checked before the player inputs his command. Local conditions apply to the room that the player is in and might include things such as is the fire lit or is he carrying the key. Finally low priority conditions include general items such as inventory and score.

The conditions appear as a series of mnemonics and refer to specific verbs and nouns, controlled by the rules of logic. A typical entry might be "IF)VERB 20 AND NOUN 15) MESS 35 WAIT END". This would translate as:- If you type empty bucket, then print "the fire splutters and goes out" and then wait for the next input. Note that before you do this, you would have to check that the player was carrying the bucket, that it was full and that there was a lit fire in the room. You can begin to see why the conditions look daunting!

The format for the entries is (CONDITION) (ACTION) or (IF..) (THEN DO...) There are 256 markers that can be set. These are used for information that can be in either of two states. For example, a door can be locked or unlocked, a guard can be asleep or awake. Similarly, you can use various counters. You might have ingested poison and must find a cure within 10 moves. When you test your adventure, you can obtain a list of markers and counters, showing their current states, a useful aid to debugging.

Of course, a vital part of any graphic adventure creator is ability to draw pictures. Certainly, the examples included in the small sample game are of a very high quality and are drawn very quickly. This knowledge of what can be produced is very reassuring to someone like myself with not an ounce of artistic skill and I found that like the rest of the package, this part of it was very simple to use. Each picture is assigned a number and two pictures can be merged if you run out of memory or want to show a special effect such as a crystal bridge appearing over the chasm when you wave the wand. Most of the picture would remain the same and you just need to superimpose the bridge.

You are allowed up to four colours in each picture although you can obtain more by a judicious use of the shade command which produces a stippling effect using one or two ink colours. You can create ellipses and rectangles, draw lines and dots as well as creating mirror images of your picture. Mistakes are easily rectified and you can remove as many of your previous graphic commands as you want. Speed is very important in graphic adventures – there is nothing worse than waiting ages for a picture to draw itself. GAC scores with a very efficient fill routine. Some irregular shapes may need more than one fill command but you are given hints as to how to make the most efficient use of this routine.

I found GAC to be a very simple product to use. You are prompted for most of your inputs and can always return easily to the main menu if you make a mistake. The use of logic takes some getting used to, not because it is very difficult but because there are so many things that you must think about and reset. You can guarantee that you will miss something glaringly obvious. It is also very easy to miss or ignore your own faults, so when you think that you have finished, get several friends to try



your game out for you land have a go at inputting as many daft entries as you can think of in order to see if your game is properly error trapped. My one slight criticism of the product is that the instruction manual could have been better presented but apart from that, I can thoroughly recommend GAC as a useful tool for all budding Tolkiens.

The Graphic Adventure Creator is available from Incentive Software Ltd at £22.95 cassette and £27.96 disk.

Club 128



Neil Day with news for Club 128 members.

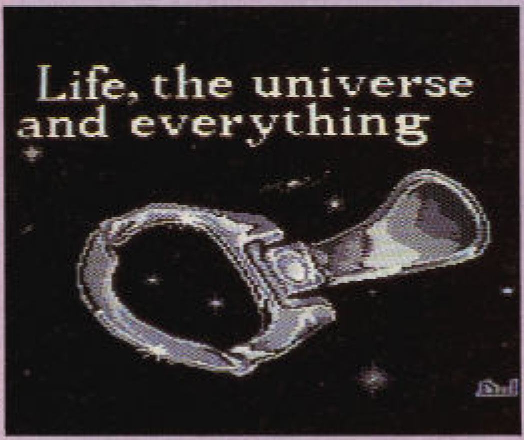
TRYING TO KEEP *YOUR COMMODORE* readers up to date with comings and going in the Club 128 part of Compunet is like trying to take dictation on to marble slabs with a chisel. Things move very fast on the electronic networks and it can be a bit hard to keep up. Upload times are often fairly short, and interesting items are added each day. So in this monthly diary you'll find references to directories that should be of long-term interest to Club 128 users, as well as mentioned of a few specific frames that are typical of what you're likely to find. I've asked the authors of the frames to try to extend them to ensure they are still available for *Your Commodore* readers.

GOTOS

A very simple innovation has provided a way to overcome one of the few irritations on Compunet. The tree-like directory structure has always made browsing a rather tedious experience. Each frame displayed on the screen has 10 entries. One of these usually says ***MORE***. You select ***MORE*** to move to the next "branch" of the directory and then, invariably, have to move further along the structure with yet another ***MORE***, and yet another, until the last syllable of recorded time, as Shakespeare used to say, but he surely wasn't using an ISTEL line at 90p per hour!.

Thanks to the universal validity of Murphy's law, the recent and most interesting new frames are always at the outer twigs of the tree structure, and is is usually simpler to read THE JUNGLE NOW or some other newsy frame to find out about the latest additions (Selecting GOTO on the duckshoot and typing NEWS will find the latest JUNGLE NOW frame: well worth checking frequently).

However, since the introduction of the GOTOS directory, finding new frames is a breeze. Select GOTO on the duckshoot and type GOTOS to get there: then DIR a frame for the particular day you're interested in. There is one GOTOS directory for each day. So neat and simple it would be surprising if it hadn't been thought of before, and it has: ICPUG has been using a similar system for some time.





Superbase And Superscript

The difference between the people who write a complex piece of software and the ones who use it is a bit like the difference between biological parents and adoptive ones: all programs bear the stamp of their progenitors, but for good day-to-day gossip, you just can't beat the users! Since the disappearance of Precision Line, the rarely used Precision Software directory, ICPUG has started up an excellent help and advice directory on *Superbase* (frame 143672). In this directory you'll find users of the popular database program talking with a mixture of affection and aggravation that exactly echoes the weary tones of long-suffering parents who would manage to find something endearing in the latest chainsaw massacre perpetrated by their offspring!

If you use the *Superbase* program you'll find it helpful to check the contents of this directory regularly as a wide range of problems are very speedily answered by a number of users whose pool of experience is impressive.

ICPUG also supports a Communications directory at 147653. Under this, at frame 193731, are hints for *Superscript* users. For example, there is some useful advice about how to set up *Superscript* files for input into the Commodore Modem Editor as Compunet Frames. If the neanderthal text entry on this editor drives you crazy and you have a lot of text to upload, DM87's advise will be very welcome.

Utilities And Useful Programs

TEC (GOTO TEC) is another good source of useful applications information and utility type programs. For example, at fram 187578 there is a wedge, uploaded by AWG, to enhance Basic with instructions to renumber the lines in programs, delete a range of lines, and many other fancy commands.

Another directory which users should watch, for handy utilities and applications advice, is the one organised by the Independent Compunet Club (GOTO ICC). Users of Trigsoft's versatile UPC1 cartridge should check our PHILS UPC DIR on 190718 uploaded by APD1. From this directory you can download an enhanced version of the Phil's Mon program supplied on disk with the cartridge.

Well, that better be it for this month. If you're not yet a member of Compunet I hope this list of goodies, all available free incidentally, will entice you to join. If you are a Compunet member, and you find something you think might be of interest to a wider audience please send me a courier (NAD2) or mbx Prestel 457467557.

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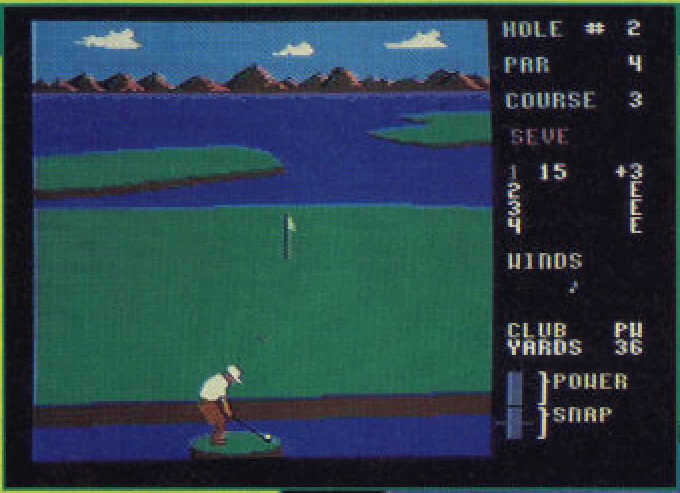
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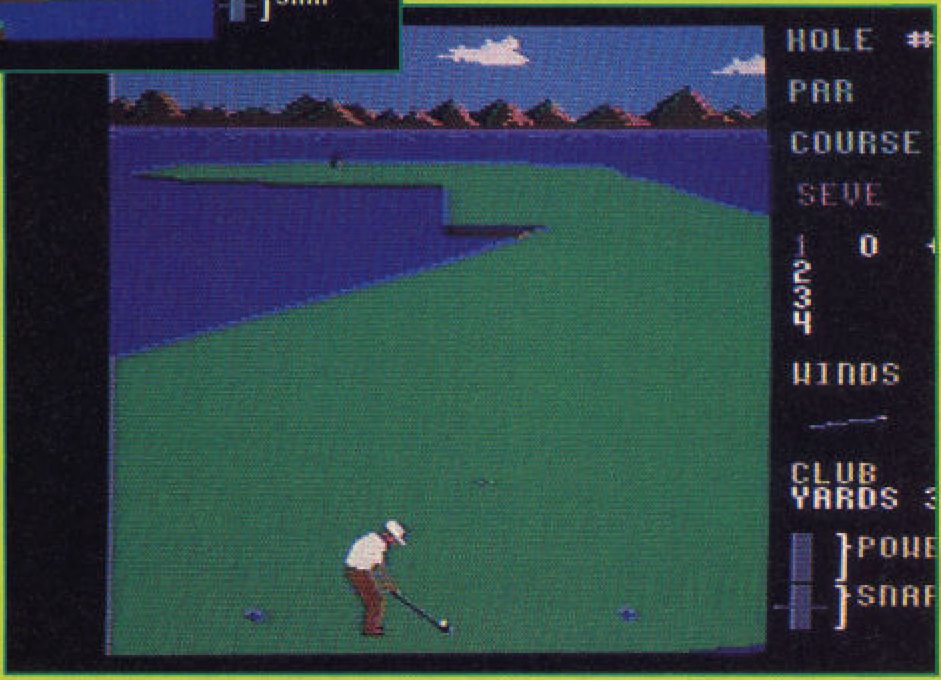
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Game of the Month





Peter Thomas dips into US Gold's Leaderboard and gives it his seal of approval.

I challenge armchair critics who sit at home watching their golfing heroes on television, to go out and buy a copy of Leaderboard and discover for themselves the realities of attempting to hit a little white ball into a hole in the grass that seems to get progressively smaller the closer you get to it.

Mind you, any game that can keep editors of computer games magazines amused during the whole of a hot summer afternoon has to be worth more than a second look!

This golfing simulation has one or two long-awaited factors which have been lacking in other games of this type such as Nick Faldo Plays the Open and Golf Construction Set. At last you are given the exact yardage to the hole from all positions of the course, so that your choice of club is much less hit and miss. This enables you to swing at the ball with much more confidence.

Two factors that I feel are missing from this program are that there is no way of saving the game in progress and you cannot obtain a golfing handicap. However the graphics are excellent and the colours have a realistc look. The sound too is a vast improvement on rival games. The swish of the backswing and the thud as clubhead meets ball are almost as pleasant to the ear as the gentle 'dollop' as the ball disappears into the hole.

After entering your names into the frame, you have a choice of four courses. For breakfast you can start with a light romp around number one course, for lunch you can tackle the slightly more difficult second, for after-noon tea the third course becomes a little heavier but the main course is not easily digestible and I suggest a stiff drink to calm your nerves before taking on this challenge.

The one thing they all have in common is that they are completely surrounded by water. In fact nearly every shot means steering the ball between and over vast expanses of the deep blue sea. As a golfing hacker myself, I was slightly disappointed to find the one of the courses did not resemble a normal golf course and lacked the familiar sights of fairways trees and bunkers.

There are three levels of play, starting with novice and moving up to amateur and then to professional. As you progress from novice to amateur, the dreaded hook and slice come into play, and as a professional you have to cope with swirling winds as well.

But before you attempt these heady heights, I suggest that you start at the practice range and tone up your swing and timing. Then you will be ready to take your 14 clubs and tackle one or all four of the courses.

The manual will assist none golfers in their selection of club as it helpfully gives the min/max yardages achievable with all the different woods and irons. Next you aim the cursor in the direction you wish the ball to go and then readjust, allowing for the strong wind that will blow the ball into the nearest bit of water it can find at the earliest opportunity!

I'm sure that all sounds rather simple and I can hear the seasoned golfers exclaim: "Keep your head still, left arm straight, slow backswing, high follow-through, hit through the ball, don't break your wrists too early!" The only thing I can say with any certainty is that the animated golfer does all these things better than I do.

The little man automatically starts his swing when you press the fire button. However the amount of power in the shot depends on the exact moment you release the button during the back-swing. The hook and slice factor relies on joystick timing as the clubhead hits the ball. If you are too early (or nervous!) the ball will shoot off at an alarming angle and disappear into the depths. If you break your wrists too late the ball will go right and you will probably need a pair of wellies to retrieve it!

Eventually you should reach the putting surface where at least there isn't any water, because, unlike most British courses, it doesn't ever rain in computer golfing games (at least not in any I've seen so far!). Reading the slope of the greens comes with practice but you are given help as to the amount of slope and whether you are facing an uphill, downhill or sideways lie. After each hole the Leaderboard records your score and that of your rivals.

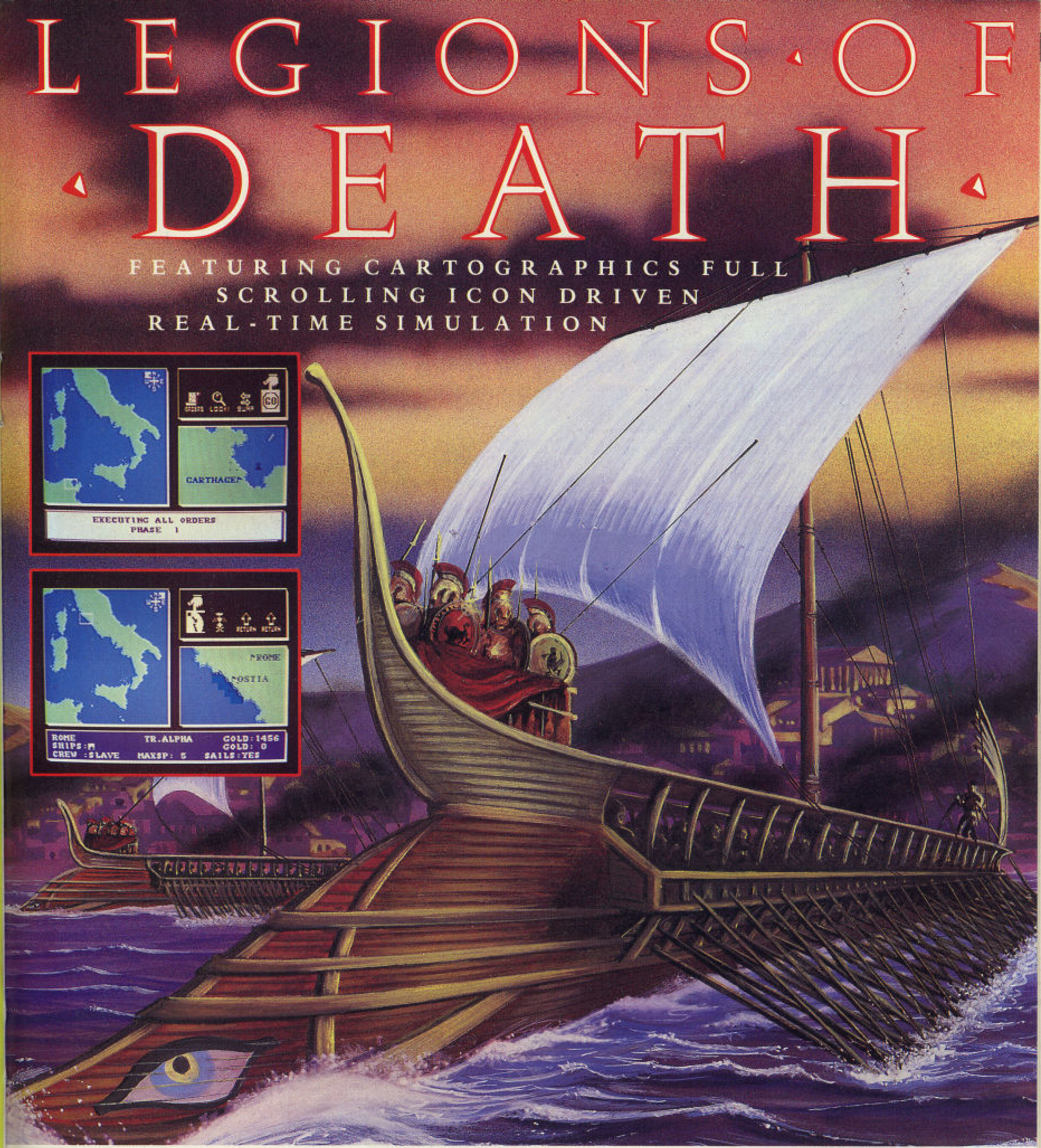
Leaderboard is an interesting variation on the golfing theme and is well worth buying since it can be enjoyed at all levels of play. The standard of the graphics is very realistic which makes it doubly enjoyable and the skill factor means the practice should make beating par an obtainable objective.

Touch Line

US Gold: Units 2/3, Holford Way, Holford, Birmingham B6 7AX. 021 356 3388.

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BACK TO THE FUTURE

Eric Doyle takes a nostalgic look at the advent of the 64 and speculates on its future.

In a world that is constantly changing, the longevity of the Commodore 64 reveals the high quality and advanced features which it boasted back in 1983. Sord, Jupiter, Aquarius, Enterprise, Texas; the list of discontinued lines is a catalogue of disasters. Even Sir Clive's Empire has fallen. Commodore may still be limping from the C16/Plus 4 wars but the 64 looks as if it will go on for a long time yet, weathering all the storms safe within the shelter of the C128.

As a refugee from the cramped confines of my faithful Vic 20, the wide open spaces of the 64K memory made me feel like a pioneer of the old West. High tech agoraphobia was offset by the limited RAM for Basic programming but the rudimentary Basic soon drew me into machine code programming. Now I wander about the innards of the 64 as freely as I prowl the rooms of my house.

One of the surprising features of the 64 is the SID chip. The sound capabilities of this phenomenal hunk of technology are still being explored. To date I've heard my own voice resynthesised with Anirog's *Voice Master*, been stunned by Rob Hubbard's innovative music and have recently heard an excellent reproduction of a big band digitised in the States.

The addition of Music Sales' synthesiser has revived my interest in keyboard playing, though Rick Wakeman's recent demonstrations show that I've still got a lot more to learn!

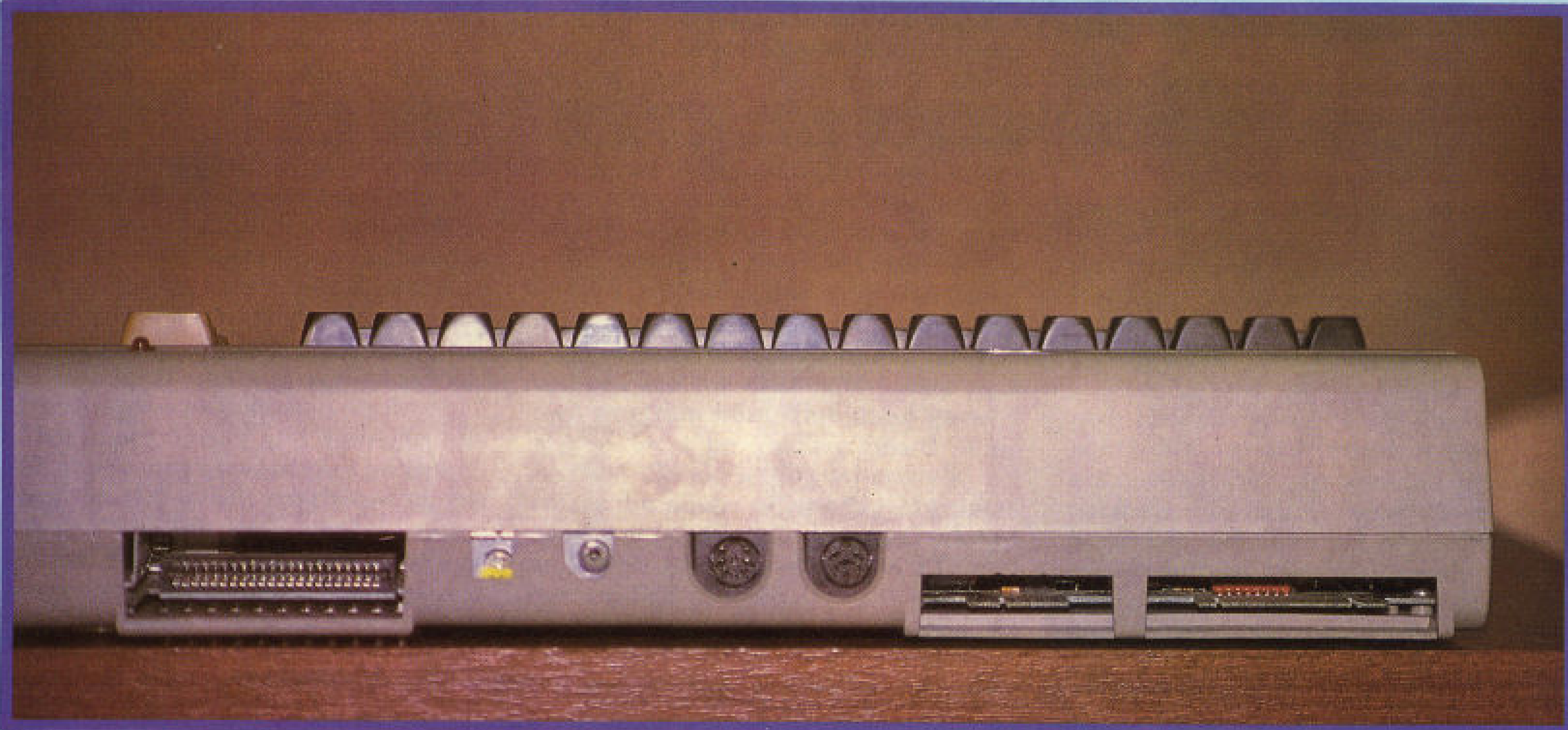




Basic Problems

The only thing I really detest about the machine is the feeble excuse for a Basic language which resides in the ROM. The advanced sound facilities, sprites and bit-mapped screen lie beyond the reach of inexperienced programmers and the number of pokes required make machine code a desirable skill to master.

If the apocryphal tales are to be believed, the actual 64 Basic was to be a much more sophisticated implementation but disagreements between the programming team and Commodore resulted in the panicky inclusion of the old Vic style ROM. Simons' Basic was an early attempt at providing a better Basic but the cost of the cartridge put most people off. If Commodore had grasped the nettle of bundling software earlier all 64s could have been supplied with a Simon cartridge. The kindest thing I can say about this extended Basic is that it would have been better than nothing.



Although the Basic was initially a curse, its existence has since given rise to a wide variety of extensions over the years, culminating in the recent glut of cartridges with on-board toolkit commands and a variety of alternative languages such as Logo, Pilot, Oxford Pascal, Forth and, more recently, C-Basic.

CP/M was originally planned as an extension and the early reviews of the machine made much of the forthcoming Z80 module. The reality was less exhilarating than the anticipation. The unit eventually hauled itself under the scrutiny of the public gaze and failed principally because many of the CP/M programs were devised for an 80 column screen, too wide for the 64.

Mobilisation

Sprites, Moveable Object Blocks, fired the imaginations of programmers who had struggled with the laborious movement of characters across the UDG (User Defined Graphics) landscapes of the Vic screen. Sections of the screen which could be moved without affecting the underlying background opened up the possibility of more complex gameplay.

The limitation of eight sprites at one time caused serious flicker effects until programmers mastered interrupt techniques. This fools the computer into believing that there are only eight sprites but splits the visible screen into several smaller screens during the scan. As a viewer of such a game you are unaware that anything unusual is going on but the effects can be staggering.

Such was the impact of the sprite concept that their appearance even benefitted Spectrum owners. Routines which produced pseudo sprites were written and this has resulted in the production of the graphically superior games we see today on all makes of computers.

It's The Biz

The computer market has been in a state of constant flux ever since the appearance of home computers. Back in 1980 a PET machine with a mere 16 or 32K of memory was considered to be a respectable business machine. By 1983, the market had become so sophisticated with the development of 16 bit machines that the 64 never really caught on in the business sector.

Today the 128 is more suited to business applications but a lot of serious software has been produced for the 64 and much of the current 128 software consists of 80 column conversions of original 64 programs.

The software varies in quality and complexity but the 40 column screen is the real limitation. Many packages employ a scrolling screen which pans sideways as the character count passes 40. Such techniques provide a solution to the column limitation but this means that an overview of the document is difficult unit a printout is made.

Viva 64

The 64 has proved to the computer industry that people need compatibility. After several years of buying and building up a software library no-one wants to be faced with rebuilding it brick by brick when upgrading to a newer model. This is one of the reasons for the Plus 4's failure and the 128's success.

Many fortunes have been made and lost in the 64 market and, though the 64 will not go on forever, it will be around for some time yet.



mucking about!

Eric Doyle leads you through the long and glorious history of C64 games of all types.

ANOTHER VISITOR. STAY AWHILE. Stay for-ever!

When I first heard these words, I knew that *Impossible Mission* was going to be something special. The voice synthesis was not only quite clearly enunciated but also sounded a little like Vincent Price. When the game started properly the animation was cartoon-like.

All this did not disguise the fact that Impossible Mission was nothing more than a platform game with the hero leaping from floor to floor collecting pieces of a puzzle. The difference between *Mission* and other games available at that time was that it set higher standards of technical wizardry and the basic gameplay was placed into a new context.

In most platform games, and this is as true today as it was then, the aim was just to collect 'treasure' and nothing more. The treasure puzzle in Mission was used to create a further dimension to the game by acting as a key to the eventual success of the player.

Although it is refreshing to see ingenuity at work, it would be too much to expect every game to display the same degree of original thinking, but to be a blockbuster a game definitely needs something extra. This can be excellent graphics, sound or it might merely be a gimmick. It's nice if the game is compulsive or addictive, as well!

Games don't have to be complex to be addictive. Hewson has had no small amount of success with *Uridium*. The most striking feature of this game is the use of colour giving the graphics a plausible 3D look. Apart from that it is just a good old fashioned shoot down the alien ships type of game. A chance element is brought in where you can gamble against the computer to gain a higher bonus which does add extra excitement to the proceedings.

Shoot-em-ups and platform games, in one form or another, dominated the early market. Who can forget Donkey Kong, Manic Miner and all of the derivatives? But players of Pacman would hardly recognise this as a basis for the multitude of mazes which have enjoyed popularity lately.

Into The Labyrinth

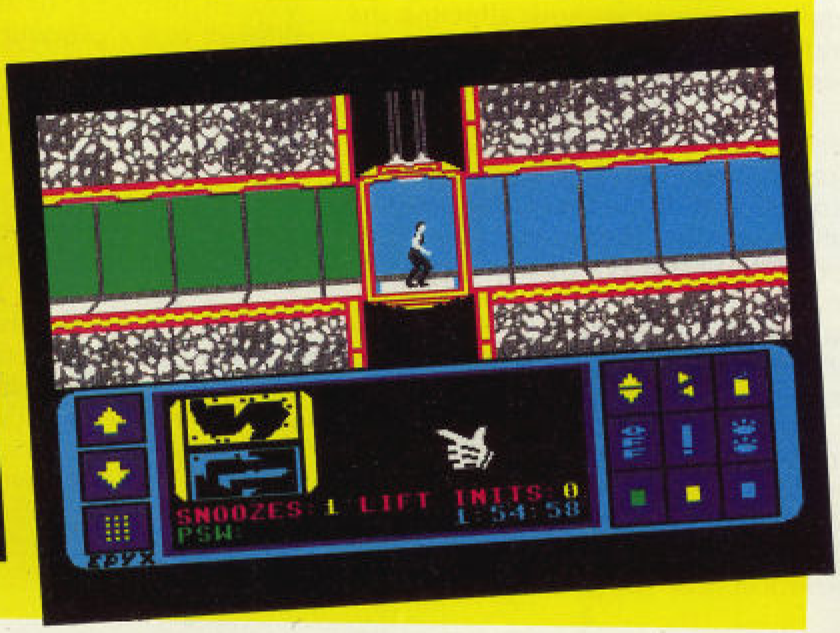
Platform games and mazes are very similar. In each a fixed path has to be followed and treasures collected. This has given rise to the maze adventure where certain objects have to be collected to help you to proceed towards the game's end. Only a few objects can be carried at a time and some are useful while others are harmful or serve no purpose at all.

Microdeal specialised in this type of game with the *Cuthbert* series and *Lands of Havoc*. These days every company seems to have a maze. Virgin has *Sorcery* and *Shogun, Blackwyche* did very nicely for Ultimate, *Space Doubt* from CRL, the excellent *Cauldron II* from Palace Software and *Frankie Goes to Hollywood* by Ocean.

All of these games owe allegiance to the numerous adventure games which have been popular since the early days of main frame computers. An adventure is a mind game, a series of puzzles which you must solve by interacting with the program's database of locations and objects.

Interrogations take place through textual input. At first only two word





commands could be accepted: Go north, take object, examine object. Ever since inglish was first used in Melbourne House's *Hobbit*, the world of adventuring has changed. Graphical representations were first put to good effect in the *Hobbit* to supplement the verbal descriptions of locations, though they are not the first. Sierra On-Line, based in the States, used graphics in adventures before the 64 was even dreamed of and collectable items often used to appear and disappear in the graphics as they were dropped or collected.

For sheer devilry and difficulty, any look at adventures would not be able to avoid Level 9 which specialises in this genre. The list of successes seem endless: *Worm in Paradise, Red Moon, Dungeon Adventure, Lord's of Time* and many more.

Though Level 9 takes the British laurels for the best adventures, it is Infocom's range must be lauded worldwide. The *Zork Trilogy* gets harder as you progress through the series but for me the best adventure award would go to *Hitch-hikers Guide to the Galaxy*. This little demon follows the comic approach which made the radio series so successful. The problems set are so complex and hilariously funny that it challenges even the most experienced adventurer.

World War are not the same thing to a computer. Anirog's game relied on your partner verifying your answer and a better solution to the problem.

By far the best Trivia style game is *Powerplay* from Arkana because it keeps the original idea of inconsequential general knowledge questions but gives multi-choice answers selected by joystick, a board 'game within the game' where you challenge your partner to a quick response question and answer session, and the chance to create your own question base. The board game is played on a perspective board in an Ancient Greek setting where you increase the power of your playing pieces by correct answers and try to challenge and overcome your enemy in a *Chess/ Archon*-like combat.

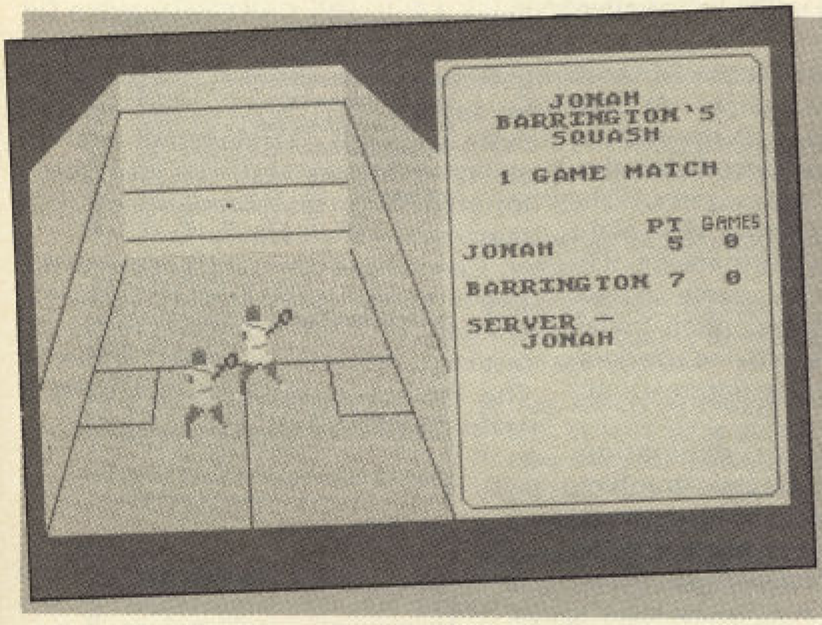
Most boardgame conversions do allow you to select the computer as an opponent which is handy if you don't know anyone else who likes to play. The oldest of these is Chess and much debate rages about which is the best. The two main contenders are Audiogenic's *Grandmaster* and *Colossus Chess* by CDS. Both companies would argue strongly that their game is the most challenging but in my opinion the 3D facility of *Colossus* just gives it the edge.

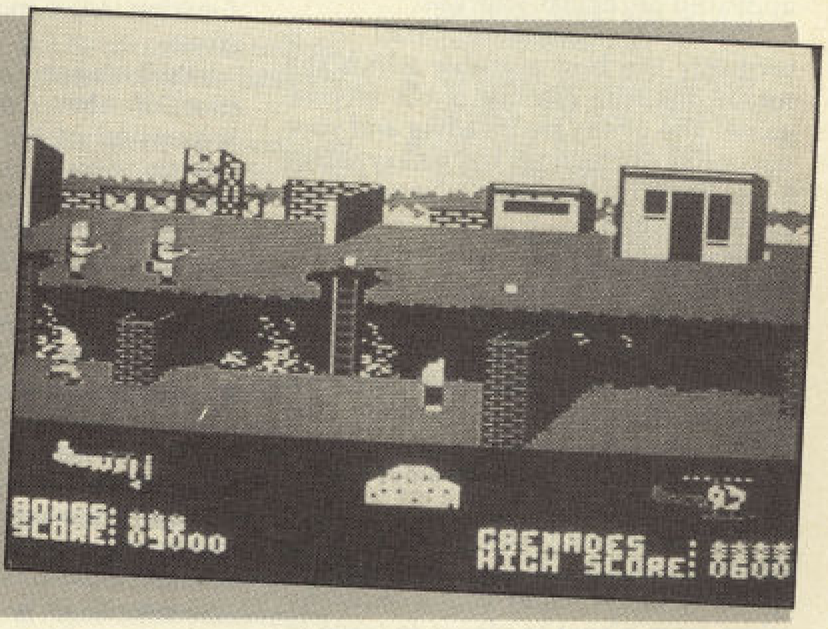
Biggles Flies Down

Film titles have also been attempted but with less success. Activision's *Ghostbusters* proved to be an enormous seller but for me it was an excellent example of the emperor's new clothes. The digitised voice was amazing, the programming was clever and the reviewers acclaimed it as a game of great merit. The hype was immense but the gameplay was dull and repetitive.

'You've seen the film, read the book, now play the game' is the sort of hype wihch fills me with dread. *A View to a Kill, Friday the 13th* and the dreadful *Back to the Future* were all strongly bound to the storyline of the film on whose success they depended. It took Microsoft to prove that games of the film can be created successfully with the interpretation of *Biggles*.

Biggles is really four games in one. The three linked games on the first side of the tape switch about fairly randomly, but completion of them all gives you a far better chance to complete side two. The pleasant part of all this is that, though side one is principally a collection of shoot-em-up games, side two is a very simple flight simulator but has an arcade adventure element. A wide variety of entertaining and





Board Meetings

Boardgames are a popular source of inspiration for software writers. *Chess, Monopoly, Scrabble* and *Trivial Pursuits* have all been successfully translated to the 64.

I have mixed feelings on some of the Trivia games because they offer no real alternative to the board game. US Gold tried to computerise the game with *Monster Trivia* but somewhere along the line no-one thought to Anglicise the questions. Anirog had a go with *Trivia*, a game based heavily on the original and with a database generator to allow your own questions to be added. Unfortunately the input of answers in both cases has problems. In *Monster Trivia* your spelling and syntax must be correct: World War Two and the Second

Undisputably, Leisure Genius (now allied to the Virgin Games empire) has the best range of board games with *Scrabble, Monopoly* and *Cluedo*. The accuracy of these games is guaranteed because they are licensed by the original manufacturers.

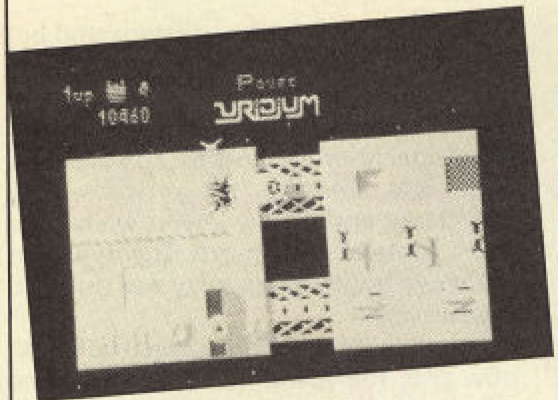
Card games have been less successful despite several attempts to spice them up. The latest and lowest example is *Samantha Fox – Strip Poker* in which clothes are not the only thing that's been ripped off.

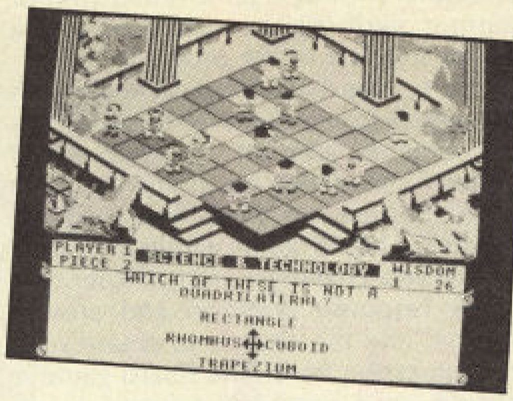
Big names sell games could be the current motto of a large section of the software industry. *Brian Jack's Super Challenge, Daley Thompson's Decathlon, Steve Davis Snooker, Roland Rat, Supergran, Minder* are all names given to add extra charisma to the games.

challenging games with a storyline which sticks to the plot.

The inclusion of the simulator was a calculated risk after the success of Ariolasoft's *Skyfox*. Much more complex flight simulators abound. If you want to fly a Harrier see Anirog, Mirrorsoft have a Spitfire or two in their hangar, Activision allows you to try the Space Shuttle but by far the most popular subject for simulators is the 747. One of the most complex is that of Doc Soft which would provide a challenge to a professional pilot.

As a flight trainer, *Solo Flight* from US Gold is unbeatable. Many years ago I saw a version of this imported from American publisher Microprose. It cost a fortune and did not have the excellent voice simulation training facilities of this latest update. For anyone wishing to try





their hand at flying from airport to airport they could do a lot worse than this.

If battles in the air are more your forte, *ACE* will give you plenty to think about. Cascade's heavily publciised game is one of my favourite pastimes. Flying a jet in search of your prey brings all of the realism of modern aerial dogfights into your living room.

To Boldly Go...

The most well known flying hits are those which take place in deep space. *Startrek* was the first computer game that I ever heard of and variants have appeared at regular intervals.

Domark's *Codename Matt II* is probably the best available which still retains the true essence of the original game. The aliens are invading and your mission is to clean up the galaxy sector by sector to make the universe a safe place to live in.

Manipulation of maps, manpower and machine is the key. Search out and destroy the enemy ships around a gridded area of space. When each enemy squadron is located the screen is switched from the usual repair and reconnaissance screens to a battle screen on which the enemy ships scream in to the attack.

This idea was taken to its limit by Firebird with *Elite*. A cargo ship in deep space is under control and must be taken from planet to planet to trade in goods both legal and contraband. The profits from successful missions can be spent on more advanced weaponry for your ship to protect it from pirate craft who patrol around the space stations like jackals waiting for a kill.

The most striking part of the game is the use of 3D wire-frame graphics which give a real sense of depth to the screen. I admit that the original BBC version has more of a fast arcade feeling about it but on the C64 there is more realism and a few more problems to contend with.

Another approach to the subject came with the *PSi-5 Trading Company* where part of your mission is to select a crew. Candidates appear with their curriculum vitae and each one must be considered for a particular role on the ship. The sense of realism becomes apparent when battle commences. Some of your crew will panic, some go totally to pieces, but most will hopefully function even more efficiently under stress.

Psi-5 is a game of total absorption and one of the closest games to my impression of life amongst the stars, a feeling which is enhanced by the excellent graphics.

For sheer programming skill Activision's *Koronis Rift* is worth seeing. It is a planetbound action game based around an interplanetary scrap metal company. Find and cannibalise wrecked ships under enemy fire to improve your chances of survival.

The planet surface generation employs advanced fractal graphics which create a 'real' terrain to roam about on as you try to locate the tangled remains of unsuccessful pioneers' spaceships.

This Sporting Life

Simulations of sport may seem like an odd concept. Many people write them off because of the contradiction between being out there playing the game and being sat indoors in front of a TV screen. They are missing the point, the games should not be seen in the same light.

The first sport simulation that I bought for my C64 was Commodore's own *International Soccer* cartridge, probably the best game in the catalogue. In those days a two player game was a bit of a novelty and we still use it in the office for the occasional league championship.

Field sports probably account for more broken joysticks than any other game but US Gold's *Summer and Winter Games* collection are a little less frantic but much more enjoyable and skillful than many of its competitors. The graphics are superb and the only bad thing I can say is that the British National Anthem is painful to listen to.

Whatever your sport there is something available. There's Squash, Basketball, Baseball, American Football, Soccer, Boxing, Cricket, Snooker and Darts with addictive oddities like Ballblazer and Rollerball alongside all of the Martial Arts game.

I've yet to see Polo and Water Ski-ing simulations but I'm sure it's just a matter of time.

The current emphasis seems to be on Golf simulations. The best in the field being Ariolasoft's *Golf Construction Set* and *US Gold's Leaderboard.* The two games are quite different though similar in appearance. *Construction Set* has more technical considerations and the ability to design, or at least load, many different courses. *Leaderboard* has much more of an arcade feel.

Games have come and gone over the past three years and it would take several editions of *Your Commodore* to do justice to the range of games for the 64. The market is maturing, but what is maturing into?

Future Markets

Although the games market still accounts for the largest part of the industry the competition has heated up lately with the appearance of budget programs. Many of them are golden oldie re-releases but there is a rising tide of new cheap label programs. Mastertronic has been alone in exploiting this area for quite some time now. Whether this trend will be good for the market on such a large scale is debatable. The rewards are small for the programmer compared to the fast fortunes of the early days. The impetus to spend time producing large, complex games will be lessened on a simple equation of rewards against development time.

The other side of the coin is that a new attitude will accommodate the changing market and it will once again parallel the pop music industry where budget and full price products exist happily side by side.

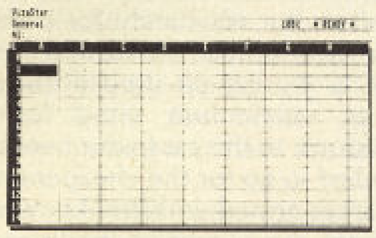
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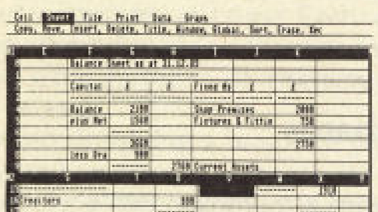
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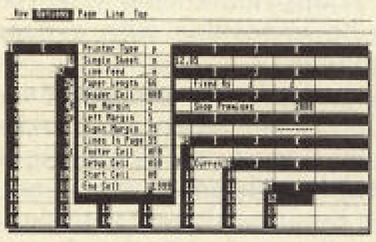
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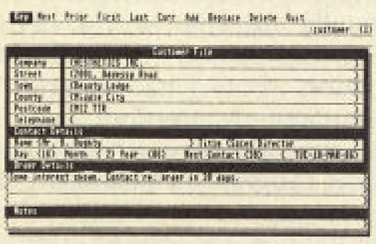
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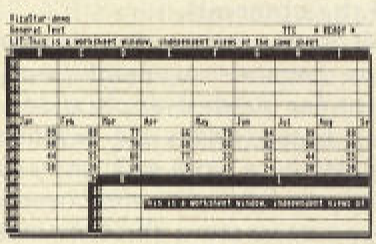
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DOWN TO BUSINESS

Eric Doyle looks at the C64's potential as a small business machine.

AS A POTENTIAL BUSINESS MACHINE the C64 is fading fast in the face of the competition from its big sister the 128. This does not mean it has no purpose in business but it does highlight the advantage of an 80 column screen over the 64's 40 columns.

Generally speaking business software can be broken down into three main categories: wordprocessors, databases and spreadsheets. Of these by far the most competitive area is in wordprocessing.

Not all businesses will benefit from computerisation because they can often demand more time than standard manual systems, especially if a database is to be utilised. Another consideration is your accountant. After all, it is he who must sort out the information from the reams of printout paper which the end of the year will generate. A spreadsheet is a very versatile and powerful tool but in the wrong hands it can be more of a curse than a blessing.

Wordprocessing

To be classified as a wordprocessor a program need do no more than to turn your computer into a typewriter. In fact the following program could be all you need if you only need to print the occasional memo:

```
10 OPEN 4,4,7:A$=" ":?CHR$(14)
20 GET A$:IF A$=" " THEN 20
30 PRINT A$;:IF A$=CHR$(20) THEN
   B$=LEFT$(B$,LEN(B$)-1):GOTO 20
40 B$=B$+A$:IF A$=CHR$(13) THEN
   PRINT 4,B$:B$=" "
50 GOTO 20
```

Such a simple program has many disadvantages for serious business applications. The width of the text is fixed to the width set on the printer, paragraph lengths must be less than 255 characters and words which are too long to squeeze on to the end of a line will be split in an arbitrary manner.

The professional user will meet circumstances where the document width varies, they may prefer right justified alignment like the columns of this article and repeated page headers, footers and numbering may be required.

As someone whose livelihood depends on the printed word, my own requirements stretch to word counts and character counts to make sure my copy will fit into the space allotted by the editor. Being fallible, I occassionally spell words incorrectly so a spelling checker is required and I sometimes want to search through my text for a particular word or phrase which I wish to change so a 'search and replace' function is essential.

A good general purpose wordprocessor is *Speedipen* from JCL Software. It lacks a spelling checker, a wordcount and has only rudimentary printer controls. It does have all of the other functions and the manual is slim and easily assimilated. *Tasword 64* and Supersoft's *Word Perfect* are also worthy of consideration.

For most business users the enhanced printing facilities of an Epson or Star machine may be desirable. In this case one of the more expensive wordpros will be needed. The two main contenders are Ariolasoft's *Paper Clip* and Precision Software's *Superscript*. Both offer a full range of advanced facilities including spell checking, special printer commands and 'mail merge'.

Mail merge is particularly useful for mailshot purposes. We've all seen the personalised letters which make comments such as, "the prize car will be delivered to the Smith household at 22 Yourstreet, Yourtown". Every letter has the name and address of the recipient in the relevant place. To do this a list of names and addresses is stored on a database and a general letter is written on the wordpro. Instead of an actual name and address, the letter contains a coded symbol which sets the printout to search the database for the next name and address and insert it in the text. In this way several hundred personalised letters can be printed out with each recipients name inserted correctly.

As a guide to prospective buyers I would suggest that you go for the most complex wordprocessor that you can afford, ensuring that the manual is comprehensive and comprehensible. Although you won't use all of the functions all of the time you will bless the wisdom of your decision as your business needs expand. The home user probably won't need to use a wordpro very often but it's handy for creating party invites, jumble sale ads and the like as well as storing oft used documents such as curriculum vitae for job applications. In this case your needs will be modest so go for the cheaper end of the market armed with the knowledge that there are plenty of sharks in this range.

Databases

Databases are filling systems which can use the special facilities of a computer to create a cross-referencing system which would be impossible with a standard filing cabinet.

Many databases are available but care must be taken in making a selection. I was using First Publishing's *FirstBASE* for a demonstration recently. I chose it because it is easy to understand and simple to set up. During the demo I accidentally hit the wrong key, the program crashed and I lost some of the information which I had entered. This was no major disaster but it did not impress my audience when I had to reload the program all over again. 'Time is money in my business. I wouldn't want that to happen too often.', remarked one of the observers.

I still use the program for my demonstrations because in many ways it's excellent for modest applications and it's disk based. Disks are essential to make a database work efficiently otherwise you are limited to the computer's memory size to store all of the entries. This is alright for home use but for business it would be a non-starter. If each file is just 256 characters long you'd be lucky to get more than 150 entries which could be manipulated at one time and each time you add to or update your file it means resaving the whole file set at the end of each session. If the computer locks up you'd have to re-enter the whole series of corrections and alterations again.

Before considering disk systems let's look at a tape system from Dutch based company Radarsoft distributed by Ariolasoft in this country. *Databasis* is data processing at its simplest level. The first requirement is an input sheet

(template) which has all of the categories of information printed on it and space to put in the specific details for each file entry.

The *Databasis* program has two ready made templates, one for an address file and the other is a catalogue for your record collection. There is also the facility to create your own template.

Each unit of a database is known as a record and each entry on the record is known as a field. *Databasis* allows you to select particular fields and a range of records for sorting into alphabetical or numerical order and for hardcopying on your printer.

The system limits you to 36,000 characters with a maximum record length of 250 characters. For a system which fully utilises the maximum record allotment, the file would only allow 144 records. Great for home use but seriously limited for even the smallest business.

Disk systems use memory very sparingly, normally only having one record in memory at a time. Each record has an allotted space on the disk and this is the same number of characters for each record.

When designing a template you are requested to specify a length for each field. This is the maximum number of characters which will fit. For example, if you design a field for Surname it has to be long enough for any surname you are liable to encounter but short enough to save on disk space. A field length of ten characters would be fine if you only know people called Smith, Jones or Williams but if a Fitzwilliam turns up you'd have to redesign the whole record template to accommodate them. This could mean re-entering all of the existing entries on to the new template, a daunting task as your file grows.

If a field is larger than the entered information the computer generates padding characters which will not show up on the screen but increases the entry to a standard length for storage. In this way all of the entries on the disk are the same length and a redundant record can be replaced by a new one without fear of overwriting another viable entry.

The most powerful database on the market is Precision Software's *Superbase*. The facilities make the manual a daunting prospect. In anticipation of this the package contains an audio cassette tutorial which will at least make 80% of users proficient enough to satisfy their own database needs. Advanced requirements are catered for in the manual and for those who still have trouble there is a very useful supplementary book on advanced techniques available from the manufacturers.

Using the sort and search facilities in this program you can specify several parameters. For instance, if you want to find all Commodore 64 owners named John, with blue eyes and living in Newcastle, you can do it assuming you base has fields for such information.

When printing out information you don't always need all of the record information printed out and often the order on the template will be wrong. This necessitates the creation of a report card template which uses specified information from the standard record set and prints it out in the given manner.

Spreadsheets

For home use, spreadsheets and similar account programs are not usually necessary. Many home accounts programs have been published but, for the majority of people, a record of the year's spending is not required. On a monthly basis, the fluctuations in incomings and outgoings can be better dealt with using pen and paper and probably in less time than it takes to load the program.

A spreadsheet is a matrix of boxes. Nothing more, nothing less. What makes it so special is that the user can define the number and contents of each box.

The boxes are known as cells and after decided the dimensions of the spreadsheet you can then define the size and contents of each cell. A cell can contain one of four types of information: descriptive text, a blank space, a numerical value or a formula.

Descriptive text is used for column or row labels to clarify the purpose for that series of cells. The computer does not need labels but you and your accountant will.

Fixed sums are entered as numerical values. An example would be a list of unit costs and quantities on an invoice spreadsheet. Each box is located by a general labelling system which often takes the form of letters across the sheet and numbers down the sheet. Locating a particular cell requires the input of the two co-ordinates such as d5 or z9. If a sheet has more than 26 characters wide then double letter labelling is used e.g. AA,BB,CC etc. or AA,AB,AC...AZ,BA, BB,BC etc.

To save time and utilise the computer to best advantage, cells can be controlled by formulae. In our example of an invoice, placing a value in the quantity column and a fixed value in the unit cost column could automatically generate a total for each entry on the invoice and update the grand total and VAT section at the bottom of the invoice sheet.

The problem with a spreadsheet is that the sheer size of the matrix will not fit on the screen and a method of window scrolling has been devised to partially overcome this problem. This works well when typing in cell contents but often on a ledger spread you will want to compare two entries which are at opposite ends of the sheet. One solution is to printout the sheet but this is time consuming so most sheets allow split screen viewing. In such a situation you can specify that certain cells will appear on one half of the screen and a separate distant set of cells will appear in the other half. Often this facility is further enhanced by allowing the two screens to be scrolled separately.

Printouts are another headache for the spreadsheet programmer and two principal solutions have been formulated, horizontal or vertical printing.

In horizontal printing the first 80 columns of the spreadsheet are printed across the paper and the full length of the sheet is printed down the paper. The printer then prints the next 80 columns under this and so on until all of the columns have been printed. The next job for the user is to set to with sticky tape and construct the full sheet from the 80 column sections.

Vertical printing is similar to horizontal but the letters are printed at a 90 degree rotation and it is the first 80 rows which appear across the top of the page until the last column is printed and then the next 80 rows are tackled.

A further use of the spreadsheet is especially useful as the business changes in size. Because the columns can affect one another it is possible to artificially alter entries to see what the net effect will be.

If you decide that a higher grade raw material will improve your product sales over a period of time, you can put in the new cost and immediately see the effect on your profit margin. Estimating the effect your improved product will have on overall sales will allow you to see how soon the business will recover, a useful demonstration when persuading your bank manager to make the necessary funds available.

Although I have said that the 64 is limited to 40 columns there is a way around this. Ariolasoft is marketing Batteries included *BI-80* adaptor which interfaces an 80-column screen chip in place of the VIC II. *Paperclip*, *Cal-Kit* and *Consultancy* are all available on the standard disk alongside the 40 column versions.

Touchline

JCL Software: 47 London Road, Southborough, Tunbridge Wells, Kent TN4 0PB. 0892 27454.
Tasman: Springfield House, Hyde Terrace, Leeds LS2 9LN. 0532 438301.
Supersoft: Winchester House, Canning Road, Wealdstone, Harrow, Middx HA3 7SJ. 01 861 1166.
Ariolasoft: 68 Long Acre, Covent Garden, London WC2E 9JH.
Precision Software: 6 Park Terrace, Worcester Park, Surrey KT4 7JZ. 01 330 7166.
First Publishing: Unit 20B, Horseshoe Road, Horseshoe Park, Pangbourne, Berks. 07357 5244.

UTILITY FURNITURE

Eric Doyle cuts his way through the jungle of cartridges now available for the C64.

CAR OWNERS HAVE BEEN CUSTOMising their vehicles for years. Modifications range from mere decoration to the purely practical and, although furry dice and go-faster stripes have yet to appear, there is a simlar trend in the computing world. Utilities of all kinds abound and the current trend seems to be more towards cartridges than either disk or cassette.

Cartridges are the most efficient way to store programs and can achieve fasterloading rates than any other storage medium. Why is it that this market has only recently blossomed?

Up to the beginning of last year the majority of cartridges available were Commodore's own, most of which were less than average games. Companies such as Supersoft had pioneered the field of utility programs with monitors and toolkits but it is fair to say that these weren't as freely available as the range of disk and cassette utilities.

Today there are several companies producing cartridges and most of them have Dutch connections. The widest range belongs to Robtech but there are also Evesham Micro Centre's *Freeze Frame*, the *Power Cartridge* from KCS, Home and Personal Computers' *Final Cartridge*, and the *Expert System* from Trilogic. Most carry machine code monitors on board, have some form of disk turbo and a reset switch.

The *Robcom 50* cartridge has a Basic toolkit which adds useful keywords such as RENUMBER to even out line numbering intervals and AUTO to generate line numbers with equal spacing. The machine code monitor occupies free RAM at 49152 but it can be relocated in any part of memory.

By far the most interesting aspects of the unit are the turbo facilities. Alongside a special tape turbo is a head alignment facility to make sure that the tape recorder is set up correctly. Of course, only Robcom turbo saved programs will turbo load because commercial cassettes carry their own unique turbo systems. This is not true of the turbo disk system which improves the speed of any normally saved disk tenfold.

The main problem with the Robtech systems is that they currently use computer RAM and many programs will overwrite the cartridge loaded operating systgem and cause a crash.

The Land Of OS

The new generation of cartridges are ethereal phantoms of the Operating System. Using just and handful of bytes as a toe-hold in the host computer they exist in symbiotic harmony to the user's benefit. It is interesting to ponder that the reason for this development has its roots in piracy.

The development of the British market has always relied heavily on cassette based software. I was fortunate enough to have a disk drive in the early days and slow loading cassette games were frustrating to use, rather like having to ride your bike everywhere because there's no petrol for your sports car. Like many other people, I spent my time finding ways to transfer the tape programs on to disk. The arrival of turbo tapes was initially a relief and in some cases these loaded faster than disk. Soon turbo disk systems were developed and I was thrown back into my search for transfer programs.

Now the main function of the cartridges is to create backup copies of cassettes on to disk. This has created a major controversy in the industry because there is nothing to stop unscrupulous people from making illegal copies for their friends. Just as home taping is killing the pop industry, so backup piracy injures the computer trade. Dongles and other software protection systems have been tried but this increases the cost of programs and any commonly adopted system would soon lead to a black market counter measure. Optical systems like Lenslok are good ideas but render many programs useless to me because of my large screen monitor.

Various pressure groups have been formed to suppress piracy but to no avail. The solution lies with the development of safeguards within the computer itself.

Beating Basic

Basic is a convenient language to put your computer through its paces but it is also a very inefficient system. Most programmers would like to use machine code but few can spare the time. The slowness of Basic can be overcome by converting the code using a compiler.

A program is stored in memory as raw Basic code. When the program runs, this code is interpreted word by word as a jump table to various routines which handle the variables dictated by the program. Basic is therefore known as an interpretive language.

A compiled program is faster because the interpretation stage is performed when the program has been written and debugged and the converted program is saved.

Compilers, such as *Basic-64* from First Software and *Blitz* from Supersoft, are disk based and often take a while to actually convert a program. Patience is rewarded with a program which will run extremely quickly and often occupies less space in memory. Both systems will operate with most Basic extensions but these must be resident in the machine when the program is used.

Basic-64 just has the edge because it will accept positively dimensioned arrays but *Blitz* won't. Program dependent arrays dimensioned by a variable will not be accepted by either e.g. DIM A(X).

If you decide to try machine code, an assembler is essential. Although crude assemblers are available in most cartridges they are not as flexible as a double pass assembler such as *Laser Genius* from Ocean.

True assemblers allow you to write your program using numbered lines as in Basic. Instead of the usual Basic commands each line has one mnemonic machine code command and lines can be inserted or deleted as the program develops.

Laser Genius allows you to use labels for jumps within a program. This means that instead of calculating the value for

the jump, a name is given to the instruction which forms the entry point to the required routine. The assembler program will insert the necessary value for the jump when the actual code is written by the assembler.

The great advantage of such a system is that instructions can be inserted into the code when debugging or improving a routine without having to worry about the effect this may have on the rest of the program. The nearest equivalent to such a labelling procedure in Basic is the subroutine procedure definition in BBC Basic. Even on the 64, if you add a line or two, you have to ensure that none of the jumps have been affected by the added lines.

Keeping On-Line

I've already mentioned Robtech's azimuth alignment utility on the *Robcom Cartridges* but there is also Interceptor Software's kit. The *Power Cartridge* from KCS has an audio function which is designed to allow the user to listen through a multiload tape for the point at which the desired program starts. A secondary advantage is that you can use this function to crudely align your tape head.

Disk drives are a different matter and can be quite costly to re-align. Robtech produces a disk maintenance kit which allows you to perform this task without any great technical knowledge. Re-alignment is fairly simple to achieve but the necessary adjustments mean that some dismantling of the drive is necessary.

With such a range of utilities, the 64 can be customised to your own particular needs. This is the main advantage of a mature machine because you get the benefit of years of experience and experimentation. There is still plenty of room for innovation but the advent of the new series of computers may cause a slow drying up of specific 64 developments. On the cheerful side, there is a 64 in the 128 and I remember rash statements of the death of the 64 when the Plus/4 and C-16 were launched. Look what has happened to them. Long live the 64.

LANGUAGE LAB — C

David Janda dons his white coat to examine the anatomy of C.

IN THIS ARTICLE, I INTEND TO TAKE A look at the structure of a C program, together with an overview of the basics necessary in understanding C.

Data Types

C has a variety of data types. When a constant is declared, the micro can usually tell what type the variable should take by simply looking at the data that will initialise it. But what if the value is to change? The compiler needs to know what type of data is going to be held in a particular variable, and that is why declaring variables is very important.

There are seven basic types in standard C:

```
int
long
short
unsigned
char
float
double
```

In standard C — int, long, short and unsigned would be data types that are used to represent intergers — whole numbers. Int is usually assigned with the standard word size of the micro. A short integer can be no longer than int and long no smaller than int.

However, actually implementing all these different types on a small version of C can be impracticle, and often, one type can store the same value as another. The C Power package (reviewed in Your Commodore June 1986) makes no distinction between int, long and short; they are treated by the compiler as being the same. In the case of C Power, int, long and short use two bytes (16 bits) to represent numbers, so the range of the integers that these types can represent is from -32768 to +32767. Actually declaring the variables is simple enough, just specify the type followed by the name of the variable:

```
int age;
long count;
short box;
int a, b, c;
```

As you can see, more than one variable can be declared on the same line.

A variation of integer variables is the unsigned integer. An unsigned integer must not be less than zero. It normally occupies the same space in memory (in C Power this is true) and thus can be larger than a signed integer. Declaring an unsigned integer is done as follows:

```
unsigned int fred;
```

The char type is in fact an unsigned integer in the range of zero to 255. The computer translates a number to a corresponding character. Declaring char variables is done as follows:

```
char initial;
char first, second, last;
char letter = 'A'
```

Float and double are types used to represent numbers with a fractional part. In standard C, double can store a number greater than float, but in C Power they are treated the same. Declaring floating point variables is done like this:

```
float pi;
float part = 66.342
```

Constants can be defined in each type:

```
whole = 1234;
letter = 'B';
beep = '/007';
laugh = 3.14111;
```

It's important to note that in the example the characters /007 were NOT assigned to beep. There are characters in the ASCII/CBM codes which cannot be displayed. C allows a character to be represented as long as it is preceded by the backslash character. Another method is to use escape sequences:

```
/n — newline
/t — tab
/b — backspace
/r — carriage return
/f — form feed
// — backslash
/' — single quote
/" — double quote
```

As an example, consider this line of C:

```
print f("This line/nis split")
```

This would be printed as:

```
This line
is split
```

Why? Because the escape sequence /n would print a new line. This type of feature is very useful in C Power, as it enables control codes (such as those for colour) to be embedded in text.

String handling is also catered for in C. However, unlike Basic, a C string cannot be dynamically created. It must be declared like all other C variables. Further more, you cannot declare strings like this:

```
char name = "Your Commodre";
```

Consider this example:

```
main ()
/* A simple C example */
[
char name[40];
```

```
printf("Hello, what's your name?/n");
scanf ("%s", name);
printf("Pleased to meet you %s,"n
name);
]
```

What's going on? Well, first the name is stored in any array whose type is char. The functions printf() and scanf() are used for I/O, and the conversion specification '%s' is used to get and put the actual string.

C has a number of functions that are associated with string handling. First, it is vital to point out that even though a string may be dimensioned to n elements (in our example 40), once a string has been assigned to the array, the end of the string will be followed by a zero (null) character. In other words, if a string array of 10 elements was specified, and I entered my name, the array would look like the following in memory;

```
David0nnnn
```

Where 'n' is an unassigned element of the array. This is important when learing how to use C functions.

C string functions may vary between different implementations of C; here is what C Power has to offer.

```
strncat (s1, s2, n)
strcmp (s1, s2)
strncmp (s1, s2, n)
char strcpy (s1, s2)
char strncpy (s1, s2, n)
strlen (s)
char index (s, c)
char rindex (s, c)
```

The first two functions join strings s1 and s2 and leave the result as s1. strncat differs in so far as it will only copy n elements. The next two functions are used to compare two strings, and will return a value of zero if the two strings are the same size, < zero if s1 is less than s2 and > 0 if s1 greater than s2.

As with the previous example, the second of the pair will only work on n characters. The next pair of functions will copy s2 into s1, and strlen will return the number of characters in a string.

The last two functions will set a pointer to the leftmost/rightmost occurence of character c in the string s.

C IN PERSPECTIVE

C is a very powerful language. It will be one of the most popular languages of the 80s — 90s and will no doubt spawn many varients. It has been described as a 'crude' language; that is, one that has many hi-level features, yet is to low level in many respects.

Whatever the case, it is portable, compact and fast — three characteristics which are important for micro users.

TABLE 1 - C KEYWORDS

Loops — for, while, do
Decision — if, else, switch, case, default
Branches — break, continue, goto
Data types — car, int, short, long, unsigned, float, double, struct, union, typedef
Storage classes — auto, extern, register, static,

Please note that not all these keywords may be implemented on all versions of C.

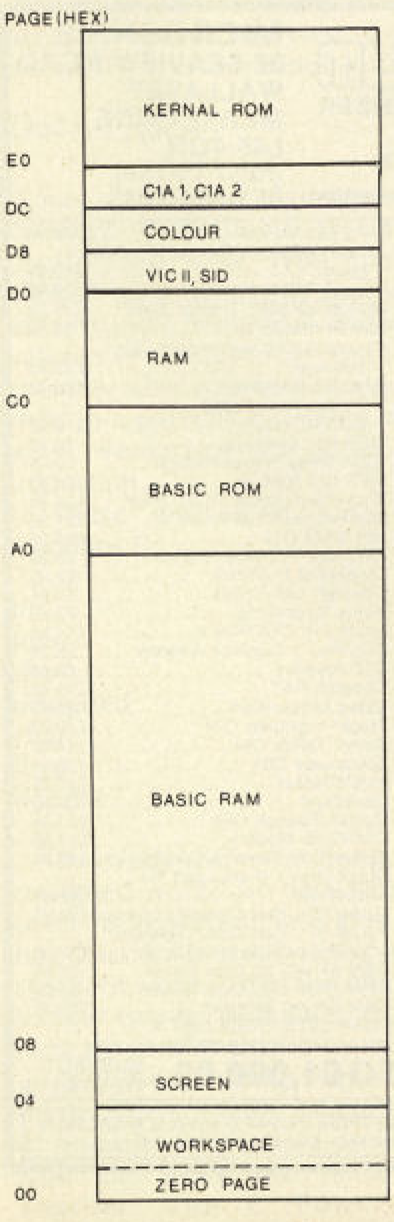
CHIP CHAT

Eric Doyle tells you which chips do what.

LOOK INSIDE A COMPUTER and what do you see? Lots and lots of chips. What are they doing there?

It is tempting to visualise a computer's memory as a massive slab of tarmac covered in thousands of regular depressions which hold numerical values. For the user this image may be very useful but to the designer nothing could be further from the truth. The architecture is as complex as any gothic cathedral and yet, in a similar way, the many small parts are united by a poetic, logical oneness.

Although I will be looking at the C64 in detail, the principles are true for all computers whether made by Commodore or not. The architecture of a computer can be broken down into several main areas: RAM, Basic interpreter, input/output routines (kernal), character pattern information and video/audio/peripheral communication channels.



Memory

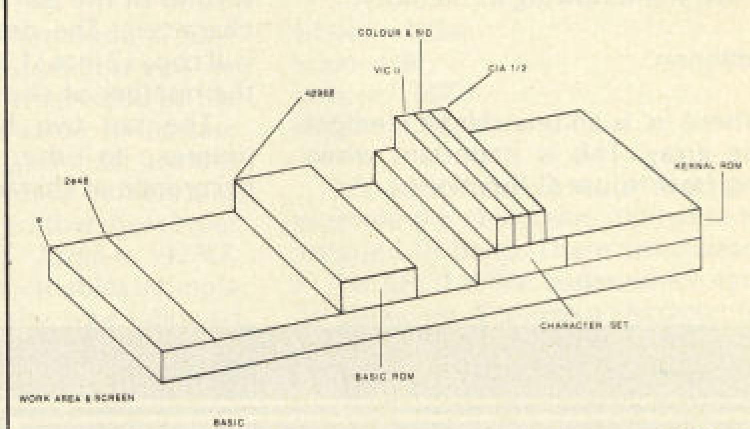
As everyone finds when they power up their brand new 64, only 38K of this memory is available to the user for Basic programs with a further 4095 bytes lying idle at the higher end of memory ready for machine code programs (49152-53247). The memory block diagram shows how the standard memory is laid out under normal circumstances.

This brings us back to the tarmac slab syndrome. The diagram actually represents the contents of several chips scattered widely about the printed circuit board inside the computer's casing.

The largest section of the 64 is comprised of eight RAM chips bearing the numerical code 4164 or 3764. Each chip contains 8192 memory locations (bytes) and together they form the 64K of RAM implied by the computer's name.

Given that the total 64K of RAM occupies all memory locations up to 65535, how can the ROMs occupy some of these locations at the same time?

Remember that the brain of the computer is the CPU (the 6510 chip). This can be commanded to communicate with specific areas of memory. Looking at the 3D representation of the computer's memory you'll see that RAM and ROM memory is 'stacked' in certain areas. To give a memory configuration as shown in the previous diagram, the CPU must be told with which layers of these stacks it can communicate.



C64

Memory location 1 determines the shape of the memory. Each of the lower three bits switches one of the three ROMs in the following way:

BIT	ROM AFFECTED	SWITCH OUT	SWITCH IN
0	Basic	AND 254	OR 1
1	Kernal	AND 253	OR 2
2	Character	AND 251	OR 4

You may also notice that the higher part of the memory is triple layered in places. The selection of which 'bank' is used is made by the computer. Here the character ROM is overlayed by the SID sound chip, the Vic video chip and the CIAI/CIA2 input/output chips.

The work done by SID and Vic is obvious, CIAI communicates the inputs from the keyboard, the cassette recorder and the joystick ports. CIA2 controls the user port and the serial DIN socket for printers and disk drives. Highly charged owners of a C128 may have found that sparking their static charge to the joystick port results in the need to replace CIAI. Delicate things these chips!

Burnt Chips

What is a chip? We all know that it contains memory locations but how is the information stored?

The standard description of a byte is a row of switches which may be off (0) or on (1). In electrical terms this means that a one is represented by an electrical voltage, a zero by no voltage.

This achieved in different ways depending on whether the chip is RAM or ROM. The difference between RAM and ROM is that RAM is volatile and anything stored there disappears when the machine is turned off (usually by one of the kids playing with the mains plugs). ROM is unchangeable with each memory being 'burnt in' permanently.

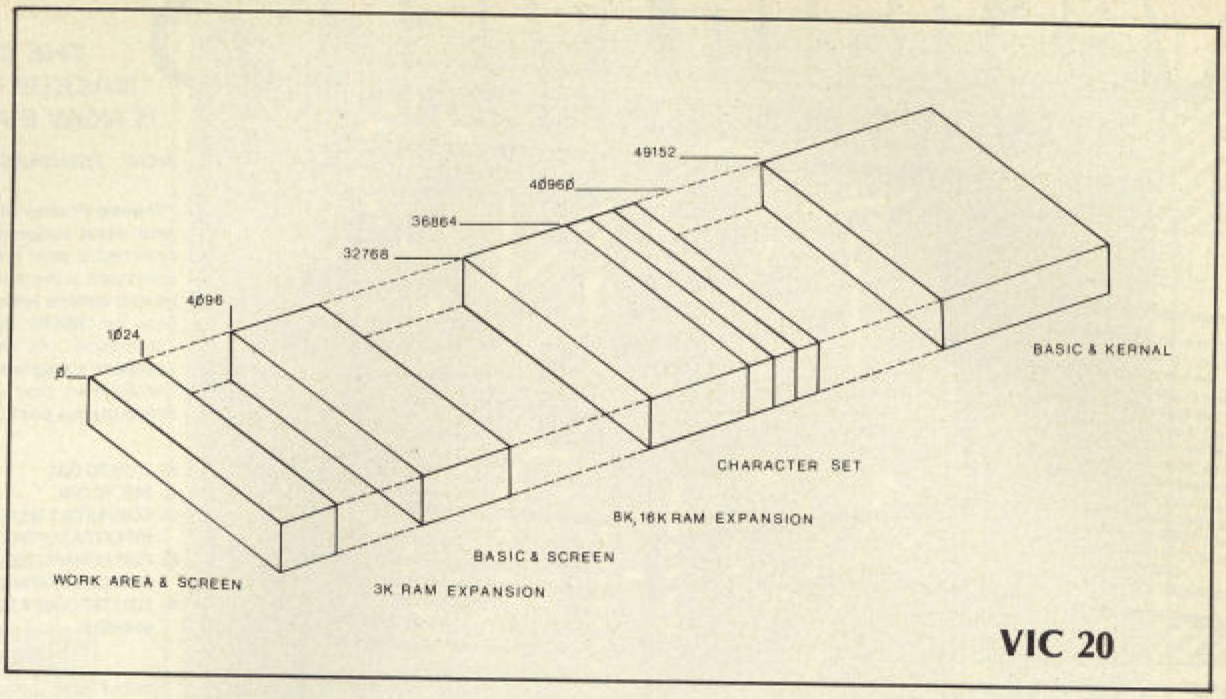
Each byte in the ROM is represented by an array of eight diodes which act like little fuses. When a chip is programmed a zero bit is created by overloading the corresponding diode. The diode blows like a fuse and the bit can no longer pass a current, the computer reads this as zero. This method is consequently known as 'blowing' a chip.

RAM chips fall into one of two categories: dynamic or static. Most of the differences will not concern us here except that dynamic is cheaper to buy but not as easy to maintain as static. In the 64 the only static RAM chip holds the colour information, the rest is dynamic.

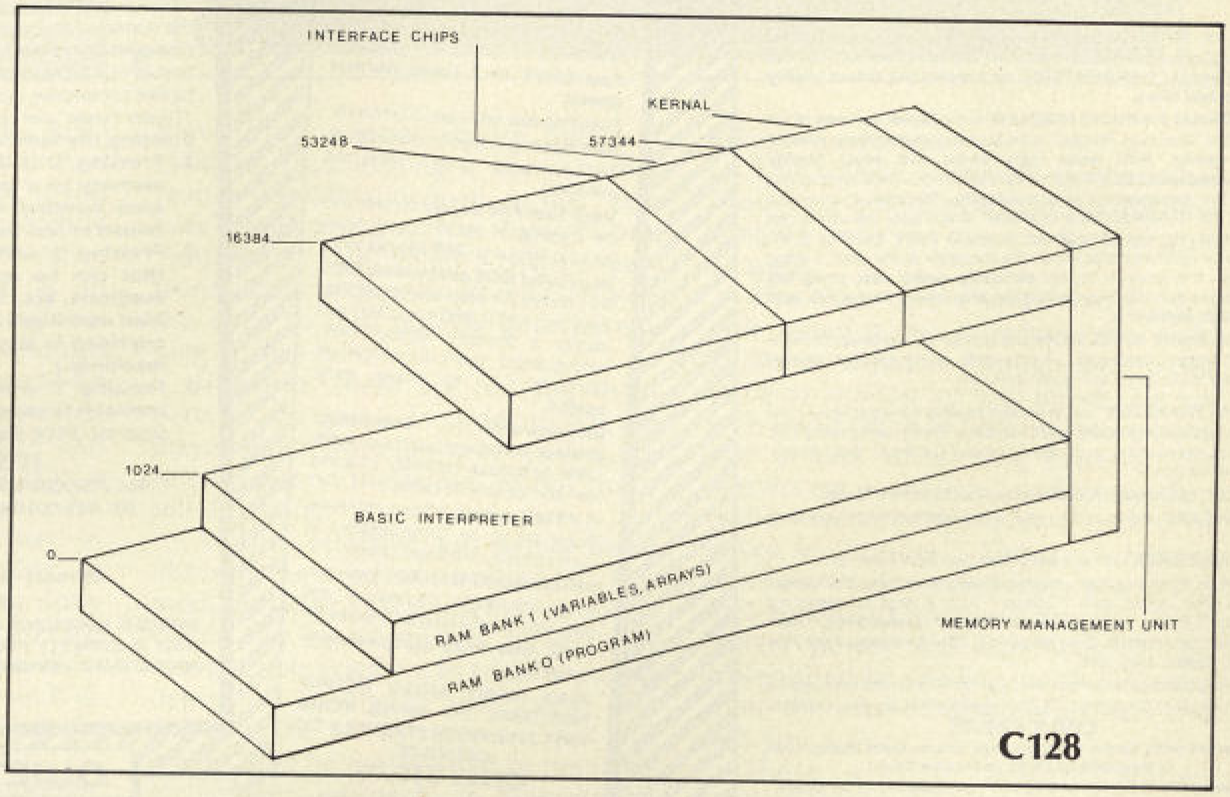
Bit information is held as a charge or lack of charge on arrays of tiny capacitors. This charge has a tendency to leak away from dynamic chips and must be refreshed at regular intervals. The busy bee Vic chip helps out here by doing the rounds every three thousandths of a second.

Small power surges at power up can randomly charge up these capacitors which is why you must never assume that any memory location is set to zero.

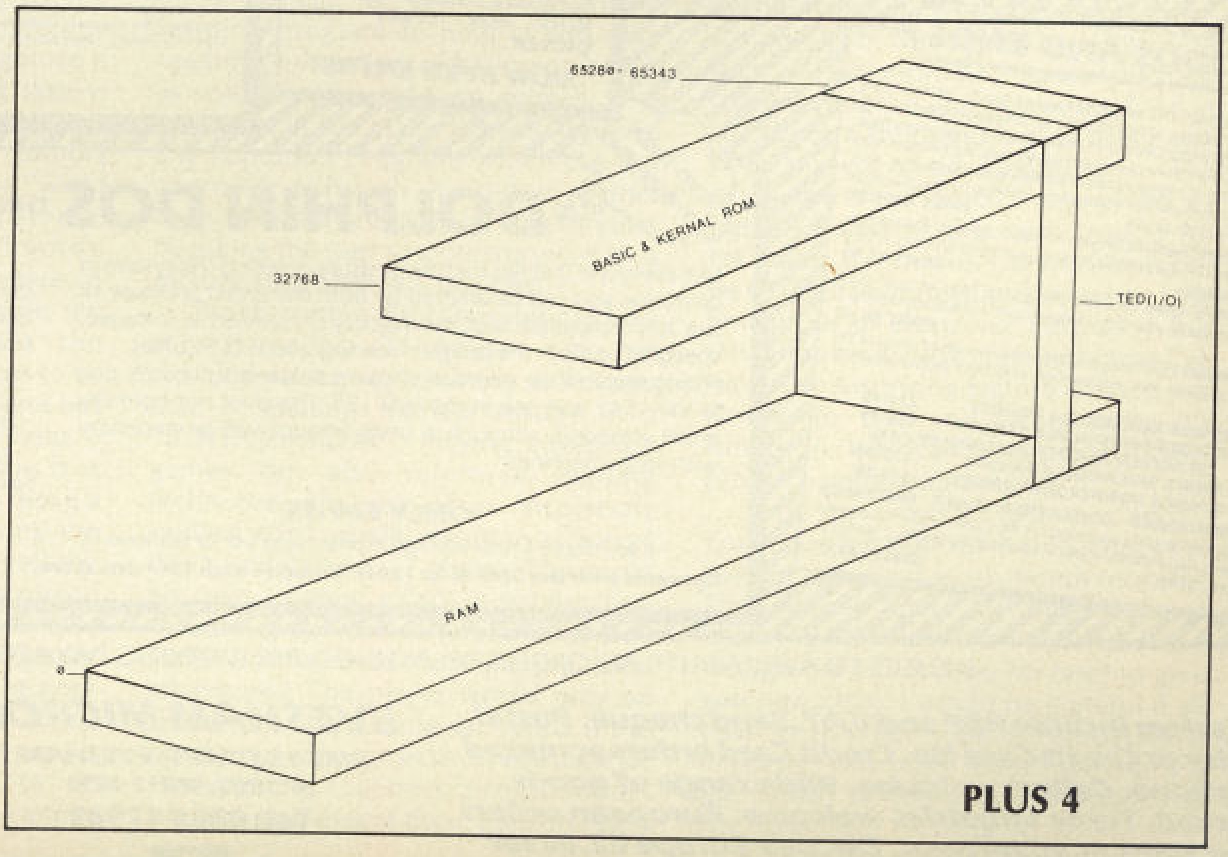
Controlling the computer's memory is the key to exciting programming on any machine. In future installments we will look at the major Commodore home computers and see what can be learnt by comparing and contrasting their chips.



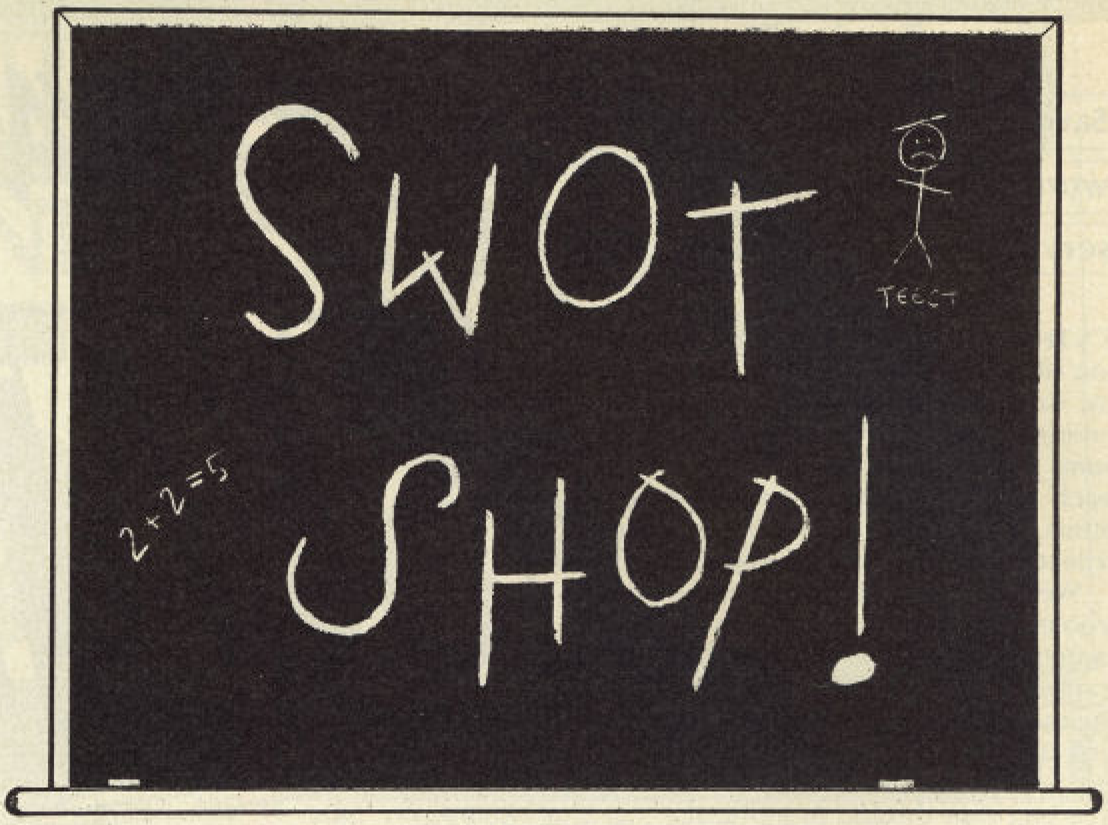
VIC 20



C128



PLUS 4



Margaret Webb brings you the latest in spelling packages.

FOR A LONG TIME TEACHING AND learning spelling has been approached in a very "laissez faire" manner. It was thought that correcting the way a child spelt a word would stop the creative flow and thus stunt the pupil at an important point in his educational growth. I don't wholly subscribe to this theory; the rules of spelling have to be learnt, especially in an age when illiteracy seems to be everywhere and being literate may help the child in a shrinking job market.

Of course, society and advertisers in particular, seem to be contriving to undermine any good work being done in our schools in language development. How many times have you, for example, seen phrases such as "Kwik Save", "Beanz meanz Heinz", "lotta bottle", "lo fat"?

As yet, I have not seen a computer program which teaches and tests the rules of spelling such as "i before e except after c". This is surprising since it is fundamental to our spelling system (illogical though it may seem on occasion). Instead, software authors prefer to tackle spelling from the "word list" approach whereby you test, by rote, the child's knowledge of lists of words. Whilst this technique has its value, it should be used to help reinforce the spelling rules and highlight the exceptions to them. There appears to be a dearth of spelling software around but here a couple which may be of help.

Word Wobbler from Longmans is in the form of a game in which you move a little man around a grid collecting the letters in the correct order to spell the proscribed word. The grid is constructed from vertical and horizontal conveyor belts and has, of course, the obligatory nasty which tries to kick you off the grid.

The game has a number of faults. Movement along the conveyors is sluggish and can often lead to an impossible situation where you cannot move from a letter square before it changes, thus loosing a life. Another fault is the difficulty level. At the "very easy" level, words such as "notice" and "important" are given – hardly easy words! Both of these faults tend to cause the child to lose quickly and thereby give up as a failure.

However, these are not the worst parts of the game. In order to tell the player which word has to be spelled, the word is put on the screen. Surely this is self defeating.

A more effective way would be to illustrate the word to be written out. This method has its limitations in that not all words can be adequately turned into recognisable graphics. In addition, some degree of ambiguity may occur, for example, the words vase, urn, pot and crock could be represented by the same picture. This approach can, however, be implemented to provide a simple learning program to help infants with reading and spelling of basic words such as colours, zoo and farm animals, toys and parts of the body. I'm not aware of any computer programs which use this approach although hand-held games have used this principle for several years by asking the user to write the word for a picture specified in a booklet.

Programming the computer can be a sort of spelling aid. Anyone who has dabbled with programming will know that a spelling mistake results in a "SYNTAX ERROR". Playing adventure games can also reinforce spelling technique. The use of an incorrectly spelled word usually results in a "Sorry I don't understand..." phrase. This could be used to good effect in conjunction with the graphical technique described earlier in the form of simple graphical adventures. The player would only be allowed to take or use an object if the word is typed in correctly. There must be enterprising teachers/programmers who can implement these ideas in really effective software.

The advent of speech synthesis has brought a whole new slant to learning spelling since you can now be told what to spell.

The Cave of the Word Wizard is a disk based game in which the child guides an explorer through eight levels of caves looking for four jewels. He has with him a torch to find his way around and a pack of sticking plasters. The plasters are your "lives" and are used up if the explorer trips over a rock or is bitten by "nasties". The torch battery tends to run down and leave you in the dark unable to find your way out. Both battery power and band-aids can be replenished by spelling words correctly when the wizard magically appears and tells you a word.

There are 10 carefully graded spelling lists starting at list one with very simple words such as ant, cat, red, man, toy and web, through to level 10 words such as synonomous, photosynthesis, correspondence and pterodactyl. All in all, about a thousand words which will keep players of all ages busy. The animation is not exactly state of the art but it's some of the best around for educational software. Certain words can be difficult to understand because of the limitations of electronic intonation but this is the best speak and spell game I've seen. The surprising feature is that it was written in 1983 and rather sadly, it's American. Why can't our programmers produce comparable work?

Time for a quick "Crie de Coeur". You may have noticed that Teacher's Pet has not appeared every month recently. The simple facts are that I'm not receiving sufficient new material (even though the Editor does his best) to give you new ideas. I would be grateful if all you publishers/authors/software importers out there would tell me (via the Editor) of new products which you are handling.

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IT'S THREE O'CLOCK IN THE MORNING. You sit at the computer keyboard having just finished a marathon typing session entering one of the superb programs from Your Commodore. Your fingers reach for the keyboard and press the letters R, U and N/. You sit back expectantly and...nothing happens.

Well, I'm sure that we have all had problem before now. When it does happen it's a matter of spending hours searching through the program for any typing mistakes. No matter how long you look or how many people help you, you can usually guarantee that at least one little bug slips through unnoticed.

Here, at Your Commodore, we pride ourselves on the quality of listing that we print. Unfortunately, this usually means that they are also very long, thus taking longer to type in and leaving more room for errors. All of the listings in Your Commodore are taken straight from a printout of working programs, it is therefore very unusual for errors to appear in the magazine.

Because of the length of our programs we do get a large number of requests from readers who would like us to put specific programs on tape or disk for them. Obviously this is very time consuming and means that we can't spend as much time working on the magazine as we would like.

The *Your Commodore* Software Service makes available all of the programs for the C64 or C128 on disk or tape published in *Your Commodore*. The cost of a cassette is £4.00 and a disk will cost £6.00.

Unless otherwise stated all C64 and C128 programs are available on the one cassette so you simply need to order the one cassette.

None of the programs are protected and we suggest that you make back up copies before you use the programs.

All programs on the cassette will be saved using a tape turbo routine. However, we cannot guarantee that all programs will work correctly with this turbo routine present. We therefore recommend that before you use any of the programs you make a copy of the programs on your own cassette or disk and use this version of the program **not** the original.

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The Final Cartridge II

Until last month, the Final Cartridge, together with Robcoms cartridges, were known as the best utility cartridges for the 64. Having received CCI's prestigious 'Utility of the Year' award, The Final Cartridge has been selling very well in the UK and elsewhere for nearly a year now.

Just before the Commodore Show in May, a French company, CAS Distribution, released a cartridge called the Power Cartridge which we reviewed last month. Now, however is the next stage in the cartridge story. H&P Computers have released a new, and if that is possible — even better, version II of the Final Cartridge.

The new final cartridge looks very nearly identical to the old one, it is small, black and pretty unobtrusive. On the back is a switch, and two innocent looking red buttons! It is these buttons that betray the first difference between versions I and II of the Final Cartridge.

Unlike the original cartridge, the version II has a neat and very easy to use menu system. Upon pressing the right hand button you are presented with the 'RESET MENU'. This has four options, all controlled by the function keys. The first option allows you to 'Reset' the computer, if for example a basic program hangs but you want to get it back, you can use reset, and then 'OLD' the program. Pressing F2 jumps you into the comprehensive machine code monitor. The last two options either give you a total reset (after which everything is lost), or reset the machine into standard 64.

THE FIRST OUTSIDE OPERATING SYSTEM FOR THE CBM 64

NEW

Freeze

On the left hand side of the cartridge you have another red button, again which controls a menu system — only this time it is a 'Freeze' menu. Most people will now be aware of the idea of freezing whatever program is residing in memory, only to subsequently save it on either tape or disk. The Final Cartridge allows you to do this (and it is one of the best examples of this genre that I have seen).

As well as the ability to copy almost anything to either tape or disk, the 'Freeze' menu also allows you to dump whatever is on the screen, either with H&P's own centronics cable, or more surprisingly using a serial cable. Thankfully you can also go from one menu to another using F8.

As well as these features, the Final Cartridge has all the features you would expect, a disk turbo that works about 6 times normal speed, a tape turbo capable of working at, ten times normal speed, a complete basic toolkit, with some excellent additions — including Auto, Renumber, Find, Help etc.

All of the function keys are redefined to allow specialist commands such as Dload, Dsave, Catalog, Run and List. For confident programers/hackers, the ML Monitor is both comprehensive and easy to use.

Overall, the Final Cartridge II is really very good. It has all the facilities that anyone could possibly need in the way of a cartridge, and they all appear to work very well. **If you are looking for a cartridge, you can't go wrong with the Final Cartridge II.**

Commodore Computing August 1986

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Micronet is usually just a local telephone call away, this means that after six O'clock in the evening it will cost you around 50p for an hour on the system.

Once you start to use Micronet, which is a section of Prestel only open to members of the Micronet 'club', you will no doubt want to download some of the software that is available onto your own disk/tape. Before you can do this you usually have to purchase the *Mustang* software from Micronet at a price of £5.00. We will give it to you FREE. This software gives your computer the ability to download software from Micronet, be it a free game or a £20.00 wordprocessor.

The *Your Commodore* offer only provides you with free Mustang software and your first quarters subscription. If you do buy anything from the system you will of course have to pay for it youself.

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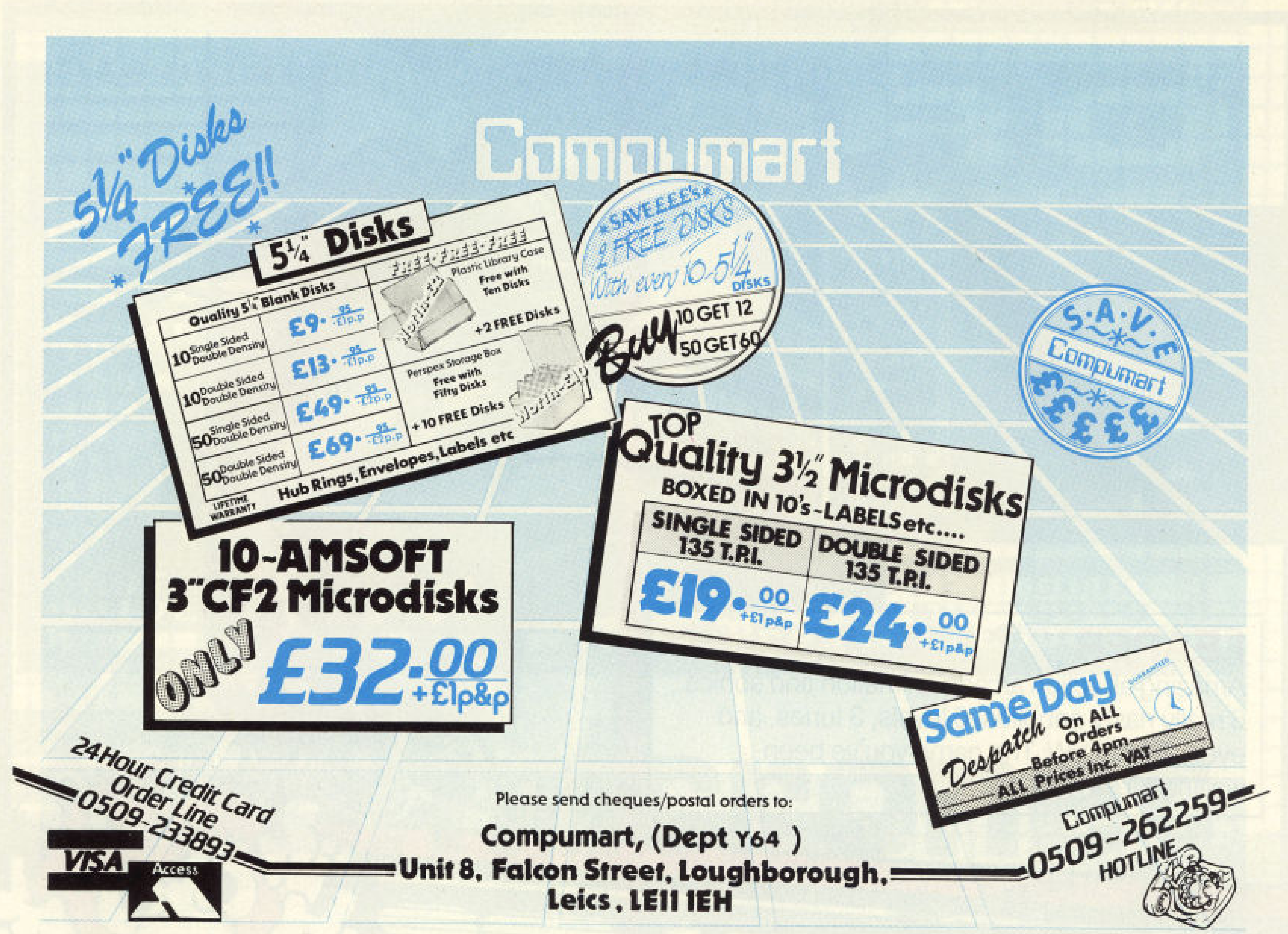
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Gordon Hamlett has been giving his C64 some speech therapy with the help of Superior Software.

THE GIFT OF THE GAB!

THINK OF ALL THE BAD NAMES YOU have ever called your computer. Maybe when your latest program has just crashed for the umpteenth time or when, after several hours of playing, you have failed to beat your best score on the latest mega-game by a measly 25 points. Certainly my machine has had to suffer some decidedly unparliamentary terms. And isn't it a relief to know that the beast can't answer back?

Well, I'm afraid that I've got some bad news for you. Using this latest utility from Superior Software, your Commodore cannot only answer you back, but the speech is of such a quality that you will even be able to understand what it says to you!

Speech!, as the name suggests, allows you to include speech in your own programs. When you consider all the vagaries of the English language, with such potential problems as plough, though, cough and tough, you will see that this is no mean achievement. The system works by dividing the different sounds that groups of letters make into 49 different phonemes. For example, consider the following four words; hard, bat, mail and bare. All of them involve the letter "a" to give them their main vowel sound and yet all four are totally different from each other. In *Speech!*, you would enter the vowel sounds as HAARD, BAET, MAYL and BAIR. Most of these unusual sounds are vowel sounds but there are also a few special consonant combinations such as "zh" to get seizure rather than "z" to get zebra.

The authors claim that you can generate an unlimited vocabulary by using these phonemes so your first task is to type in the phrase that you are interested in and see what the computer throws back at you. The chances are that it will sound either partially or nothing like what you intended. Don't worry though. The trick is to spell words phonetically using phonemes rather than spelling them normally. Thus education might become "ehdyuw kayshun". You soon become used to typing in words this way and when you play them back, they generally sound reasonable and recognisable. Once you have a phrase that is almost, but not quite, you can start tweaking and fine tuning it. This might mean changing a final "s" into a "z" or shortening or lengthening one of the vowel sounds.

Everyday conversation would be pretty boring if everything was spoken on the same note with not intonation or inflection in the voice and *Speech!* allows you to play about with these factors as well.

You can adjust the overall pitch of the voice from reasonably high to very, very low. Punctuation also affects intonation. A question mark will raise the pitch of the final syllable whilst a full stop will lower it.

The commands required to control the speech are simplicity itself. *PITCH and *SAY are the two main commands. You can also adjust the emphasis placed on each individual phoneme as you aim for a more natural rendition of a word or phrase. This is done via the * SPEAK command and is likely to involve more tweaking of your word. This seems to be a more hit or miss affair than the *SAY command. One of the phrases that I was playing about with was "I am a Dalek. Exterminate." When I tried it direct using *SAY, the first sentence was all right but needed some changes of intonation whilst the second half was fine. When I changed to *SPEAK though, "I am a Dalek" was excellent but the program kept throwing out all my attempts at "exterminate." Maybe I was just using the wrong phonemes but it was annoying when it sounded fine earlier.

The acid test for any speech synthesiser is how it actually sounds and whether I understand it without any undue effort. *Speech!* is excellent on both counts, providing that you take the time and trouble to make it so. Certainly, it is great fun trying. As for what you would use it for, I am not going to say too much as it is the subject of a competition included in the package to win a pair of professional walkie-talkies. Personally, I am going to set it up to say to the mother-in-law, all the things that I never had the courage to say myself.

Speech! is available from Superior Software price £9.95 cassette and £11.95 disk.

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COMMODORE CLINIC

Keith Eyeions brings you an insight into some little used Basic commands on the C64.

SO YOU THINK YOU KNOW ALL about Commodore Basic V2? You may assume that all it is is a few simple GOTOs, PRINTs, FOR...NEXT loops and IF...THENs, along with a mass of tedious POKEs. But look again, for in the depths of the Basic ROM several underused, but highly useful, statements and functions lie hidden.

To start with, here are some commands simplifying and clarifying the import job of printing and displaying things on the screen. Many a user has been baffled and bemused, or just bored, by the tedious array of reverse field graphic characters that, when included in PRINT statements, position the cursor, change colour, and control printing in many other ways. But these confusing symbols can be replaced by the following commands:

TAB

You might have thought that the 64 does not have a TAB command, merely cursor control symbols in PRINT statements. Well, it does. At least, it does have half a TAB command. Instead of requiring row and column co-ordinates, as most Basics do, Basic V2 uses only one number, in the range zero to 255. It moves the cursor the specified number of spaces from the left-most space of the line that the cursor is on. As a screen line is 40 spaces across, six full lines can be accessed. It is most useful for positioning things in columns.

Examples:

PRINT TAB (20) "HELLO"

replaces the horrible:

PRINT "[RIGHT 20] HELLO"

PRINT TAB(190) "HELLO"

is the same as:

PRINT "[DOWN 4] [RIGHT 30] HELLO"

SPC

This function is similar to TAB, but instead of moving the cursor the specified number of positions from the left column, it moves the cursor from its present position. This is very useful when you have a PRINT statement with a large number of spaces between items. As well as being difficult to count when typing in a listing, they waste memory. Replacing them with SPC neatens the program, saves memory, and makes the listing easier to understand at a glance.

Example:

PRINT "COMMODORE" SPC(29) "64"

replaces

PRINT "COMMODORE [29 SPACES] 64"

CHR$

This function can be very useful in programs, where it can replace control symbols in PRINT statements. It prints the character or control with the ASCII value stated in brackets.

Example:

PRINT CHR$(155)

is the same as

PRINT " ▪ "

Anyone trying to type in the latter command would probably have to look up the control symbol in the manual, before discovering that it is obtained by pressing the Commodore key and the eight key.

Here is a list of the useful ASCII codes:

Black		144
White		5
Red		28
Cyan		159
Purple		156
Green		30
Blue		31
Yellow		158
Orange		129
Brown		149
Light red		150
Grey 1		151
Grey 2		152
Light green		153
Light blue		154
Grey 3		155
CURSOR:	**up**	145
	down	17
	left	157
	right	29
	home	19
	clear	149
REVERSE:	**on**	18
	off	146

To make your program really clear and easily understandable at a glance, set variables to the ASCII codes you want to use, as below:

10 RED=28: BLUE=31: WHITE=5: CLEAR=147: HOME=19

Then, later in your program, you can see them in this way:

100 PRINT CHR$(RED)

POS(0)

This little known function gives the position of the cursor, in columns distance from the left of the screen. It returns a value from zero to 79, but those values from 40 to 79 mean the same as zero to 39. The number in brackets has no relevance (as in the funciton FRE(0)) but must be included.

Examples:

PRINT POS(0)
P=POS(0)

Next, here are a few general useful commands that you may not know about.

Save With End Of Tape Market

This command is very useful if you have a cassette with several or many programs in it. If you tell the computer to LOAD, and give it a specific program name and it fails to find that program, it will carry on trying to find it indefinitely, even when it comes to the end of the tape.

Although the auto-stop on the Datasette will stop the tape, the computer will still think it is receiveing data, and continue with a blank screen.

If however, you save the last program on the tape in the format shown below, it will put an end of tape market after it. This means that, if the situation described above occurs, the computer will halt the load as soon as the tape ends, and give an indication on the screen that the program has not been found.

Example:

```
SAVE"PROGRAM NAME",1,2
```

Status

After the computer has completed an input or output operation from an external device, it sets the variable STATUS (which can be abbreviated to ST) to give an indication of the status of the operation. If you enter 'PRINT STATUS' after switching on the computer, '0' will be printed.

If, however, you do it after a load error, or a file operation, you will find it prints a positive number. A detailed table giving the STATUS code values is given on page 85 of the *Programmers Reference Guide*, but the most important values are those in which bits 4, 5 or 6 are set. Bit 5, after a cassette read operation, indicates a checksum error, while bit 4 indicates and unrecoverable read error or mismatch. Bit 6 indicates the end of a file.

STATUS can be used when dealing with files, to find out when the end of a file is reached, by checking bit 6, and to find out whether a read operation is successful, by checking bits 4 and 5.

Example:

```
IF STATUS AND 32 OR ST AND 16 THEN PRINT "ERROR"
IF STATUS AND 64 THEN PRINT "END OF FILE"
```

CLR

This does NOT clear the screen! It makes available all possible memory, without erasing any program in memory. It erases all variables, arrays, gosub return addresses and loops, closes all files, and resets the data pointer. It is useful in direct mode after you have run a program, and want to free memory, without erasing the program, for other uses. It is also useful in a big program, when you want to go on to something different, for which you don't need all the old memory consuming variables that you had been using.

Wait

This statement stops the program operation until the contents of a specified memory location change to match a specified bit pattern, usually in response to an external event. The computer takes the value stored in the location given, and does a logical AND operation with the next number in the command. If a third number is given in the WAIT command, then it is exclusive-ORed with the result of the first calculation. If the final result is positive, then the program continues, if not, then the process repeats.

Examples

```
10 POKE 198,0: WAIT 198,255
```

This clear the keyboard buffer, and then waits for location 198, which contains the number of characters in the buffer, to change from zero. This causes the program to wait until a key is pressed, and is equivalent to

```
10 GET KE$: IF KE$="" THEN 10
```

```
WAIT1,32,32
```

This waits for a key to be pressed on the tape unit.

```
POKE 161,0: WAIT 161,8
```

This gives a pause of around 35 seconds. Location 161 is part of the three bytes storage for the built in clock, and stores units of 256 jiffies (60ths of a second). This example sets it to zero, and then waits for the 8 bit to be set. To change the length of the pause, change the 8 to another one of the following numbers: 1, 2, 4, 8, 16, 32, 64 or 128. To calculate the length of the pause in seconds, multiply the number by four.

Finally here are two useful space saving commands.

ON..GOTO/GOSUB

This statement is very useful if you have a decision point in a program, where the computer jumps to a different part of the program, depending on the value of a variable. For example, if you had a point in a program where a menu of options is displayed, and the computer asks for you to choose by giving it a number, the computer might then process this with the following lines:

```
100 IF N=1 THEN 200
110 IF N=2 THEN 250
120 IF N=3 THEN 475
130 IF N=4 THEN 100
140 IF N=5 THEN 900
```

All this can be replaced by:

```
100 ON N GOTO 200,250,475,100,900
```

All the computer does is jump to the Nth address in the list following the ON GOTO or GOSUB command. If the value of N is zero, or greater than the number of addresses listed, the computer ignores the command. Negative values give an illegal quantity error.

DEF FN

This is very useful when the same complicated calculation is done several times in one program, and is duplicated unnecessarily. It defines a function as any mathematical formula (e.g. X=3*X). It has a name, like any variable, consisting of one of two letters.

Examples

```
10 DEF FNA(X)=X*3
```

sets up function A to multiply a number by three.

```
50 PRINT FNA(7)
```

calls this function, and prints the value 21. It uses the number seven in the function, as X, and multiplies it by three. Try changing the function to do other things, and put different numbers in place of the seven. The X in the DEF FN is unimportant and could be any variable, it is merely what the computer labels the number (in this case seven) that you give it when you use the function, and it does not affect the actual variable X if you are using it.

Some functions are independent of the value given in brackets, as in this case.

```
10 DEF FNA(X)=INT(RND(1)*10)+1
50 PRINT FNA(0)
```

This prints a random number between one and 10, and, as X is not involved in the calculation, it does not matter what number you put in brackets when you use the function.

This function is, in fact, a good example of how you can use functions to save space. Having defined it, all you need to do to get a random number is:

R = FNA(0) which is much simpler than
R = INT(RND(1)*10)+1

Finally

I hope that you will find these commands useful and that what I have written has given yoiu a slightly better idea of what Basic can do.

If you have any ideas for advice or hints that may benefit other Your Commodore readers then please send them into the editorial address which can be found on the Contents page.

pilot • PILOT • pilot

Add a new language to your C64 with this program by Mycroftt Appleby.

AS WE ALL KNOW THE COMMODORE 64 is a wonderful little machine, the only thing that lets it down is the lack of a decent language for it. The Basic supplied with the machine is so outdated tht it has no graphics, no sound and no other 'fancy' commands.

I have therefore produced a version of PILOT that will run on the Commodore that comes complete with lots of new commands. If you have never come across PILOT before this is what the name stands for:
Programmed, Instruction, Learning or Teaching language.

As the name suggests PILOT is used very widely in educational applications, though this version is very much expanded for most others.

The original program was written in Basic and was obviously quite slow. The version presented here was compiled using the BLITZ compiler, making it a little faster.

In this issue of *Your Commodore* is the actual program. It is presented as a small Basic move program and a series of Basic loaders.

After entering and SAVEing all programs, LOAD the BASIC MOVE program and RUN it. Next LOAD the BASIC LOAD 1 program and RUN it, the LOADERS will do the rest. When the programs have finished they will save the program PILOT on to your disk or tape, this is the program that you should LOAD and RUN in future.

Before you can use PILOT you should LOAD and run the PILOT M/C program. Once you have done this LOAD and RUN PILOT.

Also in this issue are the instructions for using the language, in a future edition I will give a few demo programs to help you on your way.

PILOT, a Short Introduction

Pilot was first implemented on mainframe computers many years ago. This version was known as CORE PILOT and had very few instructions, no provision for editing, and no numerical capability at all. The next upgrade saw the introduction of numerical handling, more than one variable, and some editing functions, this was called COMMON PILOT. Finally the most recent introduction was PILOT 77 which introduced arrays, function handling, and lots more.

The present form you see is very altered to fit a micro and to utilise its facilities, and as such falls somewhere between COMMON PILOT and PILOT 77. So now you are the owner of MICRO PILOT for the Commodore 64.

A lot of extensions have been made for the introduction of graphics, sound, logical structures, cassette, and a screen editor, but the interpreter is still very much a PILOT interpreter. Existing Pilot programmers should find themselves at home with it, while Basic programmers will find it is a new and pleasing experience.

There follows a description of the instructions and errors etc. The way a program is written, edited, and run is still very much in the Basic tradition so programming in PILOT is not as difficult as it first may seem.

MICRO PILOT V6.4 Command Set

These commands may only be used in command mode, i.e. not in a PILOT program when it is running but in the general housekeeping of the program, editing, and examination of the program. Parameters may be passed to these commands and their correct formatting is shown under the correct command description. Most commands need only their first two letters entered e.g. RU for RUN will suffice, but for EXIT, NEW, and RESET all the letters need to be typed due to their destructive nature and the dire consequences should they be entered in error.

Display and Execution Commands

These are used to execute the pilot program and to examine the program's contents.

RUN – Clears all variables, stacks, and starts execution of PILOT program from the first line.

LIST – Displays PILOT program lines specified, defaults to first and last lines. i.e.
LIST – will display all program lines
LIST 30 – will display line 30
LIST –100 – will display all lines up to line 100
LIST 60– – will display all lines from 60 onwards
LIST 70–120 – will display all lines from 70 to 120 inclusive.
The listing may be slowed down by pressing the 'RVS' key or halted with the 'STOP' key.

PLIST – Same as list but output is to printer instead of screen.

Programming Aids and Program Interrogation Commands

These enable rapid debugging of any PILOT program by use of variable, program, and statement investigation to trace, locate, and correct an error.

DUMP – Will display a table of current variable names in use and their values.

LABELS – Will display all PILOT program lines, with line numbers, that contain labels.

FIND – Will hunt for a specified string through a PILOT program and display all the lines that contain it. i.e. FIND "FRED" will hunt for the string FRED.

REPLACE – Will hunt through a PILOT program for a specified string and replace each occurrence of it with another specified string. i.e. REPLACE "FRED" WITH "BASIL" will replace each occurrence of FRED in a PILOT program with BASIL.

FREE – Displays the number of free bytes left for access by PILOT programs.

AUTO – Starts automatic line numbering. On each carriage return a new line number is displayed. If the line is empty the automatic line numbering stops. Lines are numbered in increments of 10. Start line number defaults to 10. i.e. AUTO 70 will start auto line numbering from line 70 in increments of 10. AUTO will start numbering from 10 in 10s.

CONTINUE – Restarts PILOT program after the 'STOP' key has been pressed or a PILOT break (B:) instruction has occurred.

Operating System Commands

These commands are involved in the reinitialisation of the PILOT interpreter, the Basic system, and the PILOT program.

EXIT – Ends operation of PILOT interpreter and returns to Basic with the message 'BASIC OK'.

RESET – Total reset of pilot interpreter, total reseting of all system variables, restarts interpreter program from start.

NEW – Clears all variables, stacks, and the current pilot program.

Load and Save Commands

These commands allow the user to store and recall programs on tape.

LOAD – This command is similar in operation to that of the Basic interpreter in normal operation except that when the program is being loaded it is displayed on the screen.

SAVE – This is also similar to Basic except that the program is listed on the screen as it is saved.

VERIFY – This is similar to Basic except that the program is listed on the screen as it is being checked. If the program on tape differs to that in the computer's memory then the message "PROGRAM ERROR" is displayed.

APPEND – This is a command that is similar to 'LOAD' except that the current program in memory is not erased and the program to be appended is tagged on to the end of the existing program. To append a program there must already be a program in memory to append it to.

RUN – Not really a command but a security device in this case. It can only be used in program mode as the only instruction on the first line of a program. When a program has this as its first line it will not list when loading, if stopped with the stop key the system will reset, and when loading is completed the program will automatically run.

MICRO PILOT V6.4 Instruction Set

These instructions can be used in both PROGRAM and COMMAND mode. Program mode is during the actual execution of the PILOT program. In command mode the execution of the instructions is the same as for commands.

Instructions are composed of a single letter followed by a colon the data after that colon is dependent on the instruction. The only exceptions to this rule are labels, procedure definitions, procedure calls, and Y/N conditional flags (all explained later).

Output Instructions

These instructions allow the output of data or text to the screen or external device (i.e. printer, sound generator).

T: Type. This will display the text following the instruction on the screen. Starting and terminating quotes are not needed. If the text string ends with a semi-colon ';' then the line feed is suppressed and the next line printed will be on the same line. Variable names embedded in the text will be converted into their values, and reincorporated into the text.
Format
T: lots of text
T: lots more text;

P: Print. This is the same as 'T:', except output is to the printer and not to the screen.
Format
P: lots of text
P: lots more text;

Input Instructions

These allow the input of data or text from the keyboard/screen editor.

A: Accept input. Input a string of characters into the named variable following the instruction, with a prompt of ' '. The Screen editor will stop operate. If the variable name ends with a semi-colon then the PILOT program will not end with nothing being entered, but jusdt re-displays the prompt and tries again to get an answer. If the variable name ends in an exclamation mark '!' (or next to a semi-colon see above), then prompt and answer are directed to the printer for hard copy record of dialog between pilot program and user.
Format
A:VARNAME$
A: VARNAME$;
A:VARNAME$!;

I: Input. This will get a character directly from the keyboard and assign it to the named variable. If no key is pressed then the variable becomes empty. If the variable name ends in a semi-colon then the pilot program waits until a key is pressed before continuing.
Format
I:VARNAME$
I:VARNAME$;

Branch and Jump Instructions

These instructions interrupt the program flow and direct it to another point in the program.

J: Jump. Jumps to the named label or line number. Jumping to line numbers is not recommended due to them changing whenever a program is edited, though they have a speed advantage, and when a program has been completed the command 'LABELS' can be used in conjunction with 'REPLACE' to convert all labels to their line number equivalents.
Format
J:*label
J:30

***** Label. This sign indicates a label and needs no colon after it. When encountered in the normal running of a program this instruction is ignored, but when a 'J:' instruction is executed the interpreter will search through the program until the named label is found and program execution will recommence from the line following the label.
Format
*Label

Maths and String Manipulation Instructions

These allow a certain amount of maths and string manipulation of variables and numbers.

C: Calculate. This will make one variable equal to either a) The contents of the string variable after any manipulation or concatination has taken place, or b) The mathematical result of two variables or numbers, operated on by +,-,*,or/. ie. result$=first$+second$ makes the value of result$ equal to the sum of the values of the variables first$ and second$.
Format-
C:VAR1$=VAR2$=VAR3$ - Make the value of var1$ equal to the sum of the values of var3$ and var2$.
C:VAR1$=VAR2$-4 – Make the value of var1$ equal to the value of var2$ minus 4.
C:VAR1$=5/VAR2$ – Make the value of var1$ equal to 5 divided by the value of var—$.
C:VAR1$=5*9 – Make the value of var1$ equal to 5 multiplied by 9.
C:FULLNAME$=FIRSTNAME$ SECONDNAME$ – Makes the value of fullnames equal to the value of firstname$ a space and then the value of secondname$, i.e. if firstname$='Mycroftt' and secondname$='Appleby', then the value of fullname$ would be 'Mycroftt Appleby'.

E: Execute. This instruction takes the contents of a variable and treats it as a PILOT program line. This means it can be used for arrays and other such like as well as a form of user defined instruction. The string following the instruction may be a mixture of variables and ordinary text.
i.e. E:a$ where a$='J:'*LABEL' will execute a 'J:' instruction and jump to the label '*LABEL'.
Format
E:instruction$

Termination Instructions

These occur in a PILOT program whenever the running of the program needs to be interrupted and a return to command mode made.

S: Stop. Ends execution of PILOT program, returns to command mode, and displays 'READY.' promt.
Format-
S:

B: Break. Suspends program execution, saves current program line, and displays where program was broken. Functions in an identical way to the 'STOP' key being pressed. The program can be restarted from the next line by the use of the 'CONTINUE' command.
Format-
B:

Recursive Instructions

These enable the repeated operation of a set of instructions.

L: Loop. This is followed by a numeric parameter, either a variable or a number. It indicates the number of loops to be made. The end of the loop set of instructions is given by the 'U:' command (see below). Loops may be nested up to 10 deep with return address and value of the loop variable saved on the stack.

```
10 L:5
20 T:hello
30 T:said
40 T:FRED
50 U:
```

Will print 'hello said FRED' on the screen 5 times
Format
L:5
L:A$

U: Until. This defines the end of the loop. When a loop is in operation and 'U:' is encountered, the parameter after the last 'L:' instruction is decremented, and if still positive execution is recommenced at the line following the loop instruction. If, however, the result is zero then the loop is finished, the loop information is removed from the stack, and program execution continues from the next line.
Format- U:

Variable Handling Instructions

These are associated with the manipulation of variables and their relative values.

W: Wipe variable. This will erase any variable name and value from the variable list except TIME$.
Format-
W:VARNAME$

N: New variable list. This erases all variable names and values from variable list except TIME$
Format-
N:

D: Define variable. This puts a variable name in the variable list and assigns it a value. More than one variable may be cited in the line, but all must be separated by a colon ':'. All variable values given must be included in quotation marks.
Format-
D:VAR1$="val1":VAR2$="val2"

M: Match variable with list. This instruction is the very base of PILOT's text manipulation and comparative functions. This instruction will take a named variable and compare its value with a list in one of two possible ways. The outcome of this match will set a flag to either 'Y' or 'N' (yes or no) depending, this is called the match flag. This can be used to operate an instruction conditionally by putting either a Y or a N between the instruction letter and the colon i.e. 'TY:fred' will only type 'fred' if the match flag is Y, and 'TN:wrong' will type 'wrong' if the match flag is N. The two functions are as follows a) The 'AND' match, denoted by a '+' sign between the variable name and the list, this will only set the match flag to 'Y' if ALL the items in the list are contained in the variable value, otherwise it is set to 'N'. b) The 'OR' match, denoted by a '/' sign between the variable name and the list, this will set the match flag to 'Y' if any of the members of the list are contained in the variable value, otherwise it is set to 'N'. There can only be a maximum of 25 items in the list.
Format ('or' matches) –
M:ANSWER$/Y,YES,y,yes. Will set the match flag to Y if either Y,yes,y, or yes are contained in the value of ANSWER$.
Format ('and' matches) –
M:ENGLAND$+london, capital, england. Will set the match flag to Y if london, capital, and england are ALL contained the variable ENGLAND$.

Procedure Defining and Calling

Procedures are sections of program that work much like a subroutine in Basic. Procedures may have other procedures from within them and these may be nested up to 10 deep.

Defining a procedure is done with square brackets '[]'. The open bracket followed by the procedure name denotes the start of the procedure, and a closed bracket following the last instruction of the procedure denotes the end of the procedure i.e.
The procedure 'FRED' that prints the word 'fred' on the screen 5 times can be defined as follows.

```
10 [FRED
20 L:5
30 T:FRED
40 U:]
```

If that program were to be run as it stands nothing would happen as the interpreter will ignore any procedure it comes across unless it is properly called.

A procedure is called from within a program much like a user defined instruction or command by simply having the procedure name as the program line. Procedures may not be called from command mode as this would lead to confusion with ordinary commands i.e.
To call the procedure 'FRED' 10 times the following addition to the program is made.

```
50 L:10
60 FRED
70 U:
80 S:
```

Line 60 is the line that calls the procedure. When this is encountered execution commences of the procedure 'FRED' and when the end bracket ']' end of procedure is found execution recommences at line 70.

Pilot Graphics Facilities

These instructions enable the creation and manipulation of graphic shapes on the screen. These involve the use of text and a pixel (point) graphics system. The pixel system operates on a matrix of 80 horizontal points and 50 vertical points. Text can also be displayed on the screen concurrently with the pixel graphics. block graphics are treated the same way as text. Text always has the higher priority, so text can be displayed on a pixel graphic shape, but a shape being drawn over text will only be drawn in gaps between words or blank areas of screen. All the display methods are done by using the 'G:' instruction and there are three modes of graphic display as follows.

Mode 1

G: Followed by a string in quotes. This functions identically to 'T:' except the text is enclosed in quotes, these are not printed and only serve to allow the use of in text cursor control and colour change functions. The semicolon, if used, must be outside the quotes.
Format G:"LOTS OF TEXT"
G:"LOTS MORE TEXT";

Mode 2

G: Followed by two co-ordinates, in brackets, separated by a comma. This can then be followed by a string in quotes as above. The co-ordinates define the x/y position that the printing of the text starts from. These co-ordinates can be variables or constants. The x and y values must not excede 39 horizontally, and 24 vertically.
Format G:(0,20)"LOTS OF TEXT"
G: (X$,Y$)"LOTS MORE TEXT"

Mode 3

This is the most complex and important graphics mode as it controls the pixel graphics.

The G: instruction is followed by a worded instruction which has its own parameters following it. Variables or constants may be used. The parameters refer to positions, angles, and directions on the screen. Two methods are used, absolute plotting, and relative plotting. The absolute system treats the screen as a cartesian grid of zero to 79 on the x axis and zero to 49 on the y axis, and the

origin at the bottom left hand corner of the screen. All points and distances are taken from the position of the origin. The relative system is more vector based and uses the last point plotted as its reference point.

The last point plotted is known as the graphics cursor position or the 'turtle'. This is because the graphics cursor is considered as an invisible turtle walking around the screen leaving or rubbing out a trail behind him. This approach means that the system is easier to understand for children. This is why it is known as 'TURTLE' graphics. Most of the kernal graphics functions (i.e. plotting a point, or drawing a line between two points) are written in 6502 assembly language machine code, and are thus very fast.

Mode 3 Instructions

TEXT – Sets text mode. Replaces the block graphics with lower case letters i.e. G:TEXT

GRAPHICS – Sets graphics mode. Replaces lower case letters with block graphics i.e. G:GRAPHICS

PLOT – Sets (turns on) a pixel in absolute co-ordinates or at current turtle position in current ink colour. If co-ordinates are given the turtle will move to that position i.e.

G:PLOT(10,20) – Sets a point at co-ordinates 10,20.

G:PLOT – Sets a point at current turtle position.

UNPLOT – Identical to PLOT except it will reset (turn off) a pixel at the location specified. Syntax and options are the same as for PLOT i.e. G:UNPLOT(X$,Y$)

TURN – This sets the turtle direction to a set number of degrees, increments the angle, or decrements the angle. This assumes a circle of 360 degrees going clockwise around a circle, with O and 360 degrees being at 12 o'clock i.e.

G:TURN TO 30 – Sets the turtle direction to 30 degrees.

G:TURN –5 – Decrements the turtle direction by 5 degrees.

G:TURN ANGLE$ – Increments the turtle angle by the value of the variable 'ANGLE$'.

DRAW – Will draw a line of pixels between two points in the current ink colour. The last point plotted becomes the new turtle position. The absolute mode needs four parameters, start x and y co-ordinates, and end x and y co-ordinates. The relative mode can draw to a specified point, relative to the origin, from the current turtle position, or from the current turtle position a certain number of pixels in the current turtle direction. I.e. it makes the turtle walk to a point leaving a trail of walks a certain distance leaving a trail, in a predefined direction i.e.

G:DRAW (0,0) TO (79,49) – Will draw a line of pixels from co-ordinates 0,0 to 79,49.

G:DRAW TO (10,10) – Will 'walk' the turtle from wherever it is to co-ordinates 10,10 leaving a trail.

G:DRAW 5 – Will 'walk' the turtle 5 pixels in the current turtle direction leaving a trail.

UNDRAW – Erases a line instead of drawing it. Identical syntax and options as DRAW i.e. G:UNDRAW (X1$,Y1$) TO (X2$,Y2$)

CIRCLE – Draw a circle or arc of specified radius, position, and arc length (in degrees), in the current ink colour. Parameters that are passed in relative and absolute mode are the start and end arc position, i.e. O and 360 would draw a circle, 90 and 270 would draw a semi-circle etc, and the radius. For absolute operation the centre of the circle position must be specified, whilst for relative operation the centre is taken to be the current turtle position. The turtle moves to the final point plotted i.e.

G:CIRCLE (ARCSTART$,ARCEND$) AT (XPOS$,YPOS$) RADIUS$ – Will draw a circle of radius equal to the value of variable RADIUS$, at co-ordinates XPOS$ and YPOS$, and from ARCSTART$ to ARCEND$ degrees around the circle.

G:CIRCLE (90,270)AT10 – Draws a semi-circle of radius 10 at current turtle position.

G:CIRCLE AT (10,10)5 – Draws a complete circle of radius 5 at co-ordinates 10,10.

UNCIRCLE – Is the same as circle except a circle or arc is erased. Options and syntax the same i.e.

G:UNCIRCLE (0,360) AT (40,25) 10

RESET – Sets turtle position to the absolute origin, sets direction to north, and 'homes' text cursor to top left corner. No parameters passed i.e. G:RESET

MOVE – Will move the position of the turtle to an absolute position on the screen, or a specified number of pixels in the current turtle direction. Similar in action to 'DRAW X$' and 'DRAW TO X$' i.e.

G:MOVE TO (X$,Y$) – Will set the current turtle position to the values of variables X$ and Y$.

G:MOVE 5 – Will move the turtle 5 pixels in the turtle direction.

INK – This changes the ink colour to the parameter that follows. All subsequent printing and ploting is done in this colour until it is changed. The ink colour can also be changed by the normal means i.e. using the keys 1 to 9.

G:INK 1 – Will make all printing and plotting in white.

BORDER – This will change the border colour to the parameter that follows the instruction i.e.

G:BORDER 0 – Will make the border black.

PAPER – This sets the background colour to the parameter following the instruction i.e.

G:PAPER 2 – Will make the background or paper colour red.

LINE – This command is similar to DRAW and has all the same parameters and functions, except one extra parameter has been added to enable the drawing of dotted lines. This is a number between 0 and 255 and when converted to binary it will show what pattern will be drawn, where a 0 is a space and a 1 is a dot i.e.

G:LINE1(X1$,Y1$)TO(X2$,Y2$) – Will draw dots widely spaced.

G:LINE254(X1$,Y1$)TO(X2$,Y2$) – Will draw long dashes with small spaces between.

Sprite Graphics Under Pilot

The G:SPRITE instruction is used to define and manipulate sprites. The instructions is followed by the number of the sprite that you want to deal with, then the data to indicate what is to happen to that particular sprite.

= – This will define a sprite. Only sprites 0,1,2 can have their shapes defined but the shapes are repeated for the other sprites. e.g. sprite 0,3,6:1,4,7:2,5 are identical.

The equals sign is followed by a line of 24 dots (shifted 'Q's) or spaces enclosed in brackets. This defines the first line of the sprite, where a dot indicates a dot on the sprite and a space indicates a blank. There must be 20 more lines of 24 characters enclosed in brackets to define the other 20 lines of the sprite i.e. to define sprite 0 as a box shape the following program can be used.

```
G:SPRITE 0 is
(************************)
(************************)
(**                    **)
(**                    **)
(**                    **)
(**                    **)
(**                    **)
(**                    **)
(**                    **)
(**                    **)
(**                    **)
(**                    **)
(**                    **)
(**                    **)
(**                    **)
(**                    **)
(**                    **)
(**                    **)
(**                    **)
(************************)
(************************)
```

(in this case a dot or graphics 'Q' is represented by a '*')

(X$,Y$) – This sets the indicated sprite to the position indicated by the x and y co-ordinates. The grid the sprites are on is 0 to 320 horizontally and 0 to 200 vertically all absolute co-ordinates and the origin is the top left hand corner i.e.

G:SPRITE 3 (150,190) – Would set sprite 3 to the position 150,190.

COLOUR – This will set the colour of the indicated sprite i.e.

G:SPRITE 2 COLOUR 0 – Will set the colour of sprite 2 to black.

EXPANDX – This doubles the width of the indicated sprite if it has not already been expanded i.e.
G:SPRITE 5 EXPANDX – Will double the width of sprite 5.
CONTRACTX – This will halve the width of the indicated sprite if it has been expanded i.e.
G:SPRITE 7 CONTRACTX – Will halve the width of sprite 7.
EXPANDY – Operates the same as expandx except it doubles the height i.e.
G:SPRITE 6 EXPANDY – Will double the height of sprite 6.
CONTRACTY – Operates the same as contractx except it halves the height i.e.
G:SPRITE 0 CONTRACTY – Will halve the width of sprite 0.

Please see the Commodore 64 user guide for further details about sprites and graphics.

PILOT Variables

There can be up to 25 variables, each with UNIQUE names up to any length with all characters significant. Any characters may be used in the name. A dollar sign '$' must be the final character of the name to indicate that it is a variable. Variable values can be either numeric or string, which one is dependant upon the context in which it is used.

Numeric Variables

These are to eight significant digits, full floating point. Strings have a numeric value of zero '0'. Scientific notation is not supported.

String Variables

These variables can have string lengths up to 255, of any characters. Numbers have a string value equal to it, i.e. 25.36= "25.36".

Time Variable

This is a system variable which holds the current time in HHMMSS format. It starts up at 000000 when the machine is switched on, and will reset at 235959. The value can be operated on at any time as a normal variable, but if defined it must be a valid value in the above format.

Sub Stringing

The inclusion of two bracketed numbers after the variable name takes only part of the value. The first number indicates the first character to be considered, and the second number is the number of characters to be used. i.e. Where NAME$="MYCROFTT DAVID APPLEBY", NAME$(9,5) will equal "DAVID".

PILOT Error Messages

The error messages inform the user that there is a mistake in the program, or an unpredicted event in the program has arised. There are three kinds of error messages command, instruction, and both. Instruction errors suspend the programs execution (as in the 'B:' instruction), display the message and indicate the line that the error occured in. The continue command will recommend program execution.
Example of instruction error – 'LABEL NOT FOUND ERROR ? IN LINE 30'.
Example of command error – 'FILE NAME TOO LONG ERROR ?'.

Instruction Errors

TOO MANY VARIABLES. This happens when an attempt is made to define more than 25 variables.
NO SUCH VARIABLE. This occurs when an attempt is made to access a variable that has not been defined.
LABEL NOT FOUND. When a jump to a label has been made and the label does not exist, this error message is displayed.
TOO MANY MATCHES. Used in conjunction with the match 'M:' instruction, where there is more than 15 items in the match list.
PARAMETER OUT OF RANGE. Means that a number or variable has been used which is outside the acceptable range of the parameter in question.
DIVISION BY ZERO. Used in conjunction with the calculate 'C:' instruction, where, in a division calculation, the denominator of the equation is equal to zero.
SPRITE. An error has occured in defining or manipulating a sprite.
PROCEDURE END WITHOUT START. This happens when the interpreter encounters the ']' end procedure symbol without ever starting that procedure.
PROCEDURE NOT FOUND. A call was made to a non-existent procedure.
TOO MANY PROCEDURES. Only 10 nested calls to procedures are allowed.
TOO MANY LOOPS. An attempt has been made to next more than 10 loops.

Combined Instruction and Command Errors

SYNTAX. This happens when a spelling mistake occurs in a command or a program, or an incorrect command or instruction is encountered. Also it will arise when the correct format is not adhered too, although spaces can be included at various points to aid the reading of the program.
OUT OF MEMORY. Whent he computer runs out of memory storage for the program, variables, or to execute any kind of memory consuming operation. Or there are more than 400 program lines.

Command Errors

FILE NAME TOO LONG. File names can be up to 16 characters long, excess of this produces this error.
PROGRAM. After a DVERIFY command if the program verified is not the same as the one in memory a program error occurs.
CONTINUE. This happens if after a CONTINUE command is executed and it is not possible to continue.
APPEND. If a APPEND command is executed and there is not program already residing in memory.

A Basic Programmers Guide to Pilot

This section lists PILOT commands and instructions and their related Basic commands. Commands that are accessible from Commodore Basic are in capitals. Other Basics and standard Basics are in normal type.

PILOT	Basic
T: G: (mode 1)	PRINT
P:	PRINT N 1print
V: Z:	sound
A:	INPUT 1input
I:	GET inkey
J:	GOTO
C: D:	LET
E:	VAL eval
S:	END
B:	STOP
L:	repeat
O:	until
N:	CLR
M:	IF
+	defproc
]	endproc
G: (mode 2)	print printat
G: (mode 3)	graphics
TEXT	text
GRAPHICS	graphics
PLOT	plot set point
UNPLOT	plotover unplot reset
DRAW	draw drawto plotto
UNDRAW	undraw undrawto
	drawover unplotto
CIRCLE	circle
MOVE	curmov move
INK	ink colour
PAPER	paper colour
	background
BORDER	border colour
LINE	pattern
RUN	RUN
LIST	LIST
PLIST	1list
FREE	FRE
AUTO	auto
CONTINUE	CONT
NEW	NEW
LOAD	LOAD cload
SAVE	SAVE csave
VERIFY	VERIFY
APPEND	append merge

There are many other pilot commands and instructions not included in this list as there is no comparison or the method is different i.e. for left$ etc. see sub stringing.

PILOT Editing

A full screen editor is implemented, identical to the normal Basic one. This means that any program line can be edited by just moving the 'cursor' to the relevant piece of code and overtyping, or using the insert or delete keys to modify the line. A repeat key is supported, so that if any key is held down for more than half a second it will repeat at a rate of about 12 characters a second.

All lines of pilot programs must have a unique line number. If the number is not unique then it will replace the other line. Programs always start with the lowest line number first and progress in 10s, lines may be inserted between other lines by choosing a line number between the two i.e. line number 15 would be inserted between lines 10 and 20. After such alterations the lines are renumbered in 10s.

PROGRAM:BASIC MOVE

```
10 REM BASIC MOVE PROGRAM FOR PILO
T V2
20 PRINTCHR$(147)"NOW LOAD 'BASIC
LOADER1' AND RUN IT"
30 POKE 16999,0:POKE43,104:POKE44,
66:NEW
```

PROGRAM:BASIC LOADER1

```
10 BL=299   :LN=70    :SA=2049
20 FOR L=0 TO BL:CX=0:FOR D=0 TO 1
5
30 READ A:PRINT"[CLEAR]";A:IF A>25
5THENPRINT"NUMBER TO LARGE";LN+(L*
10):STOP
40 CX=CX+A:POKE SA+L*16+D,A:NEXT D
50 READ A:IF A><CX THENPRINT"ERROR
 IN LINE";LN+(L*10)
60 NEXT L
70 DATA 26,8,1,0,158,50,48,55,54,2
0,20,20,20,20,20,20,540
80 DATA 20,20,80,73,76,79,84,50,0,
0,0,76,146,12,76,167,959
90 DATA 14,76,129,14,9,9,30,27,27,
28,28,12,12,24,24,29,492
100 DATA 29,28,28,29,12,29,21,21,2
1,21,21,21,21,21,21,21,365
110 DATA 21,21,21,21,21,21,21,21,2
0,22,23,23,23,29,29,29,366
120 DATA 14,25,24,24,24,25,25,25,2
5,24,25,25,22,14,22,14,357
130 DATA 24,24,24,24,14,14,26,26,2
8,26,27,26,13,26,29,25,376
140 DATA 26,26,26,30,30,30,31,25,3
1,31,31,31,31,31,31,31,472
150 DATA 31,31,31,31,31,31,31,151,
174,7,116,98,42,10,128,166,1109
160 DATA 50,86,28,15,227,227,48,16
0,114,102,73,54,36,36,149,36,1441
170 DATA 36,36,36,36,36,36,36,133,
154,253,200,254,122,116,116,65,166
5
180 DATA 141,194,67,203,96,218,218
,218,158,109,109,186,218,186,176,2
05,2702
190 DATA 8,180,154,107,107,50,50,1
57,160,18,92,204,29,26,29,254,1625
200 DATA 92,92,253,6,0,9,160,162,1
59,61,218,117,117,117,118,117,1798
210 DATA 117,117,117,117,117,117,1
16,117,117,119,0,7,14,21,28,35,127
6
220 DATA 42,49,56,63,70,77,84,91,9
8,105,112,119,126,133,140,147,1512
230 DATA 154,161,168,175,182,189,1
96,203,210,217,39,3,0,0,16,232,214
5
240 DATA 100,10,106,83,43,18,123,1
84,184,186,187,191,160,2,169,32,17
78
250 DATA 36,100,16,5,32,201,13,169
,45,153,254,0,132,113,162,0,1431
260 DATA 134,98,165,100,240,12,201
,39,176,19,232,201,3,176,14,232,20
42
270 DATA 144,11,165,101,240,75,162
,2,201,100,176,1,232,189,11,9,1819
280 DATA 133,34,189,15,9,133,35,16
0,255,56,200,165,101,229,35,133,18
82
290 DATA 101,165,100,229,34,133,10
0,176,241,165,101,101,35,133,101,1
65,2080
300 DATA 100,101,34,133,100,165,98
,208,5,152,240,12,230,98,152,9,183
7
310 DATA 48,164,113,153,255,0,230,
113,232,224,4,144,192,164,113,165,
2314
320 DATA 101,9,48,76,4,191,165,14,
16,6,32,201,13,76,203,14,1169
330 DATA 165,97,240,6,165,102,73,2
55,133,102,76,203,14,165,14,48,185
8
340 DATA 3,32,66,20,165,100,73,255
,133,100,165,101,73,255,133,101,17
75
350 DATA 76,203,14,76,88,182,170,2
08,4,166,111,208,6,166,101,208,198
7
360 DATA 4,166,100,134,22,165,97,1
33,110,177,111,133,105,24,101,97,1
679
370 DATA 176,225,133,97,240,102,16
5,51,164,52,56,229,97,176,1,136,21
00
380 DATA 196,50,208,2,197,49,176,3
,32,122,31,133,51,133,98,133,1614
390 DATA 53,132,52,132,99,132,54,1
60,2,177,111,133,35,136,177,111,16
96
400 DATA 133,34,164,105,240,25,136
,240,7,177,34,145,53,136,208,249,2
086
410 DATA 177,34,145,53,165,105,24,
101,53,133,53,144,2,230,54,160,163
3
420 DATA 2,177,100,133,35,136,177,
100,133,34,164,110,240,14,136,240,
1931
430 DATA 7,177,34,145,53,136,208,2
49,177,34,145,53,76,12,24,166,1696
440 DATA 101,208,29,166,100,134,22
,166,99,228,52,208,19,166,98,228,2
024
450 DATA 51,208,13,165,97,240,9,24
,101,51,133,51,144,2,230,52,1571
460 DATA 177,111,170,200,177,111,1
33,106,200,177,111,133,107,165,112
,208,2398
470 DATA 28,165,111,133,22,165,107
,197,52,208,18,165,106,197,51,208,
1933
480 DATA 12,138,240,9,24,101,106,1
33,51,144,2,230,52,228,97,240,1807
490 DATA 8,160,4,144,4,160,1,166,9
7,132,102,160,255,232,200,202,2027
500 DATA 240,32,177,106,209,98,240
,246,169,1,176,2,169,4,37,60,1966
510 DATA 240,2,169,255,133,100,133
,101,169,128,133,14,10,133,13,76,1
809
520 DATA 201,14,165,102,16,232,164
,105,208,34,164,97,240,8,165,102,2
017
530 DATA 48,7,169,4,208,5,169,2,44
,169,1,37,60,240,2,169,1334
540 DATA 255,133,100,133,101,169,1
28,133,14,76,201,14,165,97,208,6,1
933
550 DATA 165,110,48,222,16,227,165
,102,69,110,48,210,196,97,208,28,2
021
560 DATA 165,106,197,98,208,22,165
,107,197,99,208,16,165,108,197,100
,2158
570 DATA 208,10,169,127,197,112,16
5,109,229,101,240,186,144,176,176,
208,2557
580 DATA 160,0,132,105,132,106,132
,107,162,144,165,108,133,110,16,18
,1730
590 DATA 73,255,133,108,165,109,73
,255,133,109,230,109,208,2,230,108
,2300
600 DATA 165,108,208,8,162,136,165
,109,240,22,132,109,48,6,202,6,182
6
610 DATA 109,42,16,250,133,106,165
,109,133,107,134,105,132,108,132,1
09,1890
620 DATA 165,14,16,3,32,255,19,164
,60,192,7,176,3,76,215,10,1407
630 DATA 185,12,9,133,85,185,17,9,
133,86,165,110,69,102,133,111,1544
640 DATA 165,97,32,84,0,76,201,14,
162,2,165,108,197,100,208,6,1617
650 DATA 164,109,196,101,240,9,202
,69,100,48,18,176,2,162,4,138,1738
660 DATA 37,60,240,2,169,255,133,1
00,133,101,76,201,14,176,238,144,2
079
670 DATA 238,165,97,208,4,133,100,
240,68,36,112,16,3,32,27,188,1667
680 DATA 165,100,5,101,208,80,165,
97,201,129,144,74,233,144,16,70,19
32
690 DATA 201,249,176,22,105,7,170,
165,99,208,59,165,98,232,240,6,220
2
700 DATA 74,176,51,232,208,250,134
,100,240,19,170,165,99,133,40,165,
2256
710 DATA 98,74,102,40,176,32,232,2
08,248,133,100,165,40,133,101,36,1
918
720 DATA 102,16,3,32,201,13,169,12
8,133,14,166,60,224,7,176,3,1447
730 DATA 76,153,11,76,254,12,76,49
,11,32,92,12,165,14,48,3,1084
740 DATA 32,66,20,70,60,176,12,165
,108,37,100,133,100,165,109,37,139
0
750 DATA 101,144,10,165,108,5,100,
133,100,165,109,5,101,133,101,76,1
556
760 DATA 201,14,76,72,178,169,0,13
3,107,240,19,165,105,201,129,144,1
953
770 DATA 244,233,144,16,237,170,16
5,106,74,102,107,232,208,250,6,110
,2404
780 DATA 144,2,73,255,133,108,165,
107,144,2,73,255,133,109,96,32,183
1
790 DATA 231,255,32,177,12,165,57,
133,80,165,58,133,81,160,6,208,195
3
800 DATA 5,32,228,12,160,10,185,14
7,31,190,148,31,76,35,29,32,1351
810 DATA 243,12,76,172,14,165,80,1
33,57,165,81,133,58,76,172,14,1651
820 DATA 162,5,189,147,31,149,45,2
02,16,248,166,46,134,96,133,95,186
4
830 DATA 228,48,208,4,197,47,240,1
9,160,1,169,0,200,145,95,192,1953
840 DATA 6,208,249,152,101,95,144,
230,232,176,225,165,55,164,56,133,
2391
850 DATA 51,132,52,104,168,104,162
,248,154,72,152,72,169,0,133,59,18
32
860 DATA 133,17,173,155,31,133,65,
173,156,31,133,66,96,240,17,224,18
43
870 DATA 8,208,78,165,109,229,101,
133,101,165,108,229,100,76,28,13,1
851
880 DATA 24,165,109,101,101,133,10
1,165,108,101,100,133,100,112,3,76
,1632
890 DATA 201,14,162,0,134,98,134,9
9,134,102,144,5,198,102,32,201,176
0
900 DATA 13,169,0,133,14,133,112,3
2,219,188,76,201,14,165,98,5,1572
910 DATA 99,208,238,165,100,48,234
,165,102,16,3,32,201,13,76,201,190
1
920 DATA 14,165,100,69,108,133,102
,165,100,16,3,32,201,13,165,108,14
94
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930 DATA 16,16,73,255,133,108,165,
109,73,255,133,109,230,109,208,2,1
994
940 DATA 230,108,165,100,166,101,1
97,108,144,10,164,108,133,108,165,
109,2116
950 DATA 134,109,170,152,160,0,132
,98,132,99,132,100,132,101,132,106
,1889
960 DATA 132,107,168,240,70,133,40
,134,41,165,40,5,41,240,158,70,178
4
970 DATA 40,102,41,144,25,24,165,1
01,101,109,133,101,165,100,101,108
,1560
980 DATA 133,100,165,99,101,107,13
3,99,165,98,101,106,133,98,6,109,1
753
990 DATA 38,108,38,107,38,106,144,
209,165,100,73,255,133,100,165,101
,1880
1000 DATA 73,255,133,101,230,101,2
08,2,230,100,96,138,240,191,74,170
,2342
1010 DATA 144,19,24,165,101,101,10
9,133,101,165,100,101,108,133,100,
165,1769
1020 DATA 99,101,107,133,99,6,109,
38,108,38,107,144,222,169,25,133,1
638
1030 DATA 22,32,224,169,76,172,14,
165,57,166,58,133,122,134,123,133,
1800
1040 DATA 61,134,62,76,225,167,133
,60,104,48,30,208,65,104,133,110,1
720
1050 DATA 104,133,105,104,133,106,
104,133,107,104,133,108,104,133,10
9,224,1944
1060 DATA 12,176,3,76,113,11,76,42
,12,104,133,108,104,133,109,224,14
36
1070 DATA 12,176,21,224,10,176,14,
164,14,16,16,224,7,176,3,76,1329
1080 DATA 153,11,76,254,12,76,49,1
1,76,45,12,76,194,11,104,133,1293
1090 DATA 111,104,133,112,224,7,17
6,3,76,80,10,76,199,9,170,201,1691
1100 DATA 14,144,163,189,122,8,133
,85,189,23,8,133,86,108,85,0,1490
1110 DATA 104,104,104,104,165,122,
166,123,133,57,134,58,36,17,80,31,
1538
1120 DATA 165,145,201,127,208,25,3
2,183,171,56,176,4,32,68,166,24,17
83
1130 DATA 32,65,168,32,183,171,104
,104,32,104,168,36,17,112,225,160,
1713
1140 DATA 0,132,59,230,57,208,23,2
30,58,208,19,160,0,24,101,57,1566
1150 DATA 133,57,144,10,230,58,208
,6,160,0,230,57,240,246,177,57,201
3
1160 DATA 16,156,201,192,144,119,2
01,224,176,91,170,188,43,8,177,45,
2151
1170 DATA 16,11,200,165,14,48,48,3
2,66,20,76,24,15,200,177,45,1157
1180 DATA 48,54,165,14,16,7,132,34
,32,255,19,164,34,200,36,112,1322
1190 DATA 16,3,32,27,188,165,97,14
5,45,200,165,102,9,127,37,98,1456
1200 DATA 145,45,200,165,99,145,45
,200,165,100,145,45,200,165,101,14
5,2110
1210 DATA 45,160,0,132,59,76,203,1
4,152,56,101,45,133,73,165,46,1460
1220 DATA 105,0,76,97,19,201,230,1
76,20,133,59,230,57,240,10,201,185
4
1230 DATA 228,144,3,76,159,17,76,1
01,16,230,58,208,242,166,59,133,19
16
1240 DATA 59,240,126,164,14,208,11
2,165,97,208,4,133,100,240,68,36,1
974
1250 DATA 112,16,3,32,27,188,165,1
00,5,101,208,69,165,97,201,129,161
8
1260 DATA 144,63,233,144,16,59,201
,249,176,22,105,7,170,165,99,208,2
061
1270 DATA 48,165,98,232,240,6,74,1
76,40,232,208,250,134,100,240,19,2
262
1280 DATA 170,165,99,133,40,165,98
,74,102,40,176,21,232,208,248,133,
2104
1290 DATA 100,165,40,133,101,160,1
28,36,102,16,30,32,201,13,76,200,1
533
1300 DATA 15,165,101,72,165,100,72
,165,99,72,165,98,72,165,97,72,169
5
1310 DATA 165,102,72,152,72,240,8,
165,101,72,165,100,72,152,72,165,1
875
1320 DATA 59,201,160,176,72,170,18
8,107,8,177,45,16,20,133,14,200,17
46
1330 DATA 200,177,45,133,100,200,1
77,45,133,101,160,0,132,13,76,203,
1895
1340 DATA 14,200,177,45,16,60,133,
13,152,56,101,45,133,73,133,100,14
51
1350 DATA 165,46,105,0,133,74,133,
101,160,2,177,73,133,99,136,132,16
69
1360 DATA 14,177,73,133,98,136,177
,73,133,97,76,203,14,201,166,176,1
947
1370 DATA 125,230,57,240,9,160,0,2
01,164,144,57,76,159,17,230,58,192
7
1380 DATA 208,243,200,177,45,133,9
7,200,177,45,133,102,9,128,133,98,
2128
1390 DATA 200,177,45,133,99,200,17
7,45,133,100,200,177,45,133,101,16
0,2125
1400 DATA 0,132,14,132,13,132,112,
76,203,14,177,57,230,57,208,10,156
7
1410 DATA 230,58,208,6,41,3,201,3,
240,240,133,72,133,96,177,57,1898
1420 DATA 133,71,10,38,96,10,38,96
,10,38,96,56,229,71,168,165,1325
1430 DATA 96,229,72,170,152,24,101
,45,133,95,138,101,46,133,96,165,1
796
1440 DATA 95,105,2,133,73,165,96,1
05,0,133,74,76,8,19,201,231,1516
1450 DATA 176,111,201,176,144,15,1
33,14,41,15,133,101,160,0,132,100,
1652
1460 DATA 132,13,76,203,14,162,0,2
01,170,176,125,160,1,133,14,201,17
81
1470 DATA 167,144,6,208,19,177,57,
170,200,177,57,133,101,134,100,200
,2050
1480 DATA 152,160,0,132,13,76,190,
14,177,57,133,97,200,177,57,133,17
68
1490 DATA 102,9,128,133,98,200,177
,57,133,99,200,177,57,133,100,200,
2003
1500 DATA 177,57,133,101,160,0,132
,13,132,14,169,6,76,190,14,133,150
7
1510 DATA 14,41,31,16,165,160,1,17
7,57,230,57,208,14,230,58,208,1667
1520 DATA 10,240,242,201,240,176,2
32,41,7,160,1,133,97,132,14,165,20
91
1530 DATA 57,170,24,101,97,133,57,
164,58,144,2,230,58,232,208,1,1736
1540 DATA 200,134,98,132,99,76,12,
24,134,13,240,45,201,172,144,27,17
51
1550 DATA 208,8,134,14,32,123,175,
76,201,14,201,175,144,10,32,72,161
9
1560 DATA 175,160,1,132,14,76,201,
14,76,8,175,133,14,165,144,16,1504
1570 DATA 1,202,134,100,133,101,76
,201,14,134,14,169,168,160,174,32,
1813
1580 DATA 162,187,76,201,14,177,57
,24,101,47,133,105,200,177,57,101,
1819
1590 DATA 48,133,106,230,57,208,2,
230,58,160,0,177,105,170,24,101,18
09
1600 DATA 47,133,95,200,138,17,105
,240,102,177,105,76,180,17,208,213
,2053
1610 DATA 177,57,168,24,177,47,170
,101,47,133,95,200,138,17,47,240,1
838
1620 DATA 78,177,47,101,48,133,96,
160,1,177,95,133,70,136,177,95,172
4
1630 DATA 133,69,160,4,177,95,133,
11,10,105,5,101,95,133,88,169,1488
1640 DATA 0,101,96,133,89,200,104,
48,23,104,133,110,104,133,105,104,
1587
1650 DATA 133,106,104,133,107,104,
104,32,92,12,165,109,72,165,108,72
,1618
1660 DATA 104,133,114,209,95,144,1
1,208,6,200,104,209,95,144,5,76,18
57
1670 DATA 69,178,200,104,133,113,1
98,11,240,78,200,104,48,23,104,133
,1936
1680 DATA 110,104,133,105,104,133,
106,104,133,107,104,104,32,92,12,1
65,1648
1690 DATA 109,72,165,108,72,104,13
3,108,209,95,144,11,208,6,200,104,
1848
1700 DATA 209,95,144,5,76,69,178,2
00,104,133,109,170,165,114,5,113,1
889
1710 DATA 24,240,10,32,76,179,138,
101,109,170,152,164,34,101,108,134
,1772
1720 DATA 113,133,114,198,11,208,1
79,138,166,114,10,38,114,36,69,48,
1689
1730 DATA 70,36,70,48,112,10,38,11
4,101,113,144,2,232,24,101,88,1303
1740 DATA 133,73,138,101,114,101,8
9,133,74,36,59,80,3,76,41,19,1270
1750 DATA 160,4,177,73,133,101,136
,177,73,133,100,136,177,73,133,99,
1885
1760 DATA 136,177,73,133,102,9,128
,133,98,136,177,73,133,97,132,13,1
750
1770 DATA 132,14,132,112,76,203,14
,101,88,133,73,165,114,101,89,133,
1680
1780 DATA 74,160,0,36,59,112,19,20
0,177,73,133,101,136,177,73,133,16
63
1790 DATA 100,169,128,133,14,132,1
3,76,203,14,165,14,48,125,32,66,14
32
1800 DATA 20,160,0,240,118,101,113
,144,2,232,24,101,88,133,73,36,158
5
1810 DATA 59,112,120,133,100,138,1
01,114,101,89,133,74,133,101,169,2
55,1932
1820 DATA 133,13,160,2,177,100,133
,99,136,132,14,177,100,133,98,136,
1743
1830 DATA 177,100,133,97,76,203,14
,160,0,36,59,177,95,48,166,200,174
1
1840 DATA 177,95,16,15,112,76,133,
13,166,73,165,74,134,100,133,101,1
583
1850 DATA 76,243,18,112,3,76,129,1
8,165,14,16,3,32,255,19,165,1344
1860 DATA 112,16,3,32,27,188,160,0
,165,97,145,73,200,165,102,9,1494
1870 DATA 127,37,98,145,73,200,165
,99,145,73,200,165,100,145,73,200,
2045
1880 DATA 165,101,145,73,160,0,132
,59,76,203,14,138,101,114,101,89,1
671
1890 DATA 133,74,169,25,133,22,165
,97,240,72,164,99,196,52,208,4,185
3
1900 DATA 164,98,196,51,144,60,165
,101,240,56,164,52,165,51,56,229,1
992
1910 DATA 97,176,1,136,196,50,208,
2,197,49,176,3,32,122,31,133,1609
1920 DATA 98,133,51,132,99,132,52,
160,2,177,100,133,35,136,177,100,1
717
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1930 DATA 133,34,164,97,136,240,7,
177,34,145,51,136,208,249,177,34,2
022
1940 DATA 145,51,160,2,165,99,145,
73,136,165,98,145,73,136,165,97,18
55
1950 DATA 145,73,132,59,76,203,14,
104,24,105,1,133,85,104,105,0,1363
1960 DATA 133,86,104,133,14,208,14
,133,112,104,133,102,104,133,97,10
4,1714
1970 DATA 133,98,104,133,99,104,13
3,100,104,133,101,108,85,0,162,0,1
597
1980 DATA 165,102,16,1,202,134,100
,134,101,169,128,133,14,96,160,0,1
655
1990 DATA 132,14,132,112,132,97,13
2,98,132,99,162,144,165,100,133,10
2,1886
2000 DATA 16,5,32,201,13,165,100,2
08,8,162,136,165,101,240,22,132,17
06
2010 DATA 101,48,6,202,6,101,42,16
,250,133,98,165,101,133,99,134,163
5
2020 DATA 97,132,100,132,101,96,16
5,14,41,128,197,12,240,247,170,48,
1920
2030 DATA 189,36,112,16,3,32,27,18
8,165,97,201,129,144,160,233,144,1
876
2040 DATA 16,69,166,102,48,40,201,
249,176,16,105,7,170,165,98,232,18
60
2050 DATA 240,4,74,232,208,252,134
,100,240,13,170,165,98,74,102,99,2
205
2060 DATA 232,208,250,133,100,165,
99,133,101,169,128,133,14,96,170,3
2,2163
2070 DATA 77,185,165,98,56,106,102
,99,232,208,249,240,230,165,14,16,
2242
2080 DATA 9,166,101,165,100,16,43,
76,72,178,165,102,48,249,36,112,16
38
2090 DATA 16,3,32,27,188,165,97,20
1,129,176,5,169,0,170,240,18,1636
2100 DATA 233,145,16,227,170,165,9
8,232,240,6,74,102,99,232,208,250,
2497
2110 DATA 166,99,133,21,134,20,96,
165,14,16,7,166,101,165,100,208,16
11
2120 DATA 198,96,36,112,16,3,32,27
,188,165,102,48,186,165,97,201,167
2
2130 DATA 129,144,22,233,137,16,17
6,170,165,98,232,240,4,74,232,208,
2280
2140 DATA 252,170,134,101,169,0,13
3,100,96,162,0,240,245,166,97,240,
2305
2150 DATA 150,166,101,208,25,165,1
00,133,22,166,99,228,52,208,15,165
,2003
2160 DATA 98,197,51,208,9,24,101,9
7,133,51,144,2,230,52,177,98,1672
2170 DATA 76,187,21,165,14,240,3,3
2,255,19,177,57,10,105,40,32,1433
2180 DATA 213,175,76,201,14,165,14
,48,5,133,102,76,203,14,165,100,17
04
2190 DATA 16,3,32,201,13,76,203,14
,165,14,48,249,165,97,201,144,1641
2200 DATA 144,13,36,112,16,3,32,27
,188,32,204,188,76,201,14,32,1318
2210 DATA 66,20,76,203,14,165,14,1
6,21,160,255,165,100,48,6,200,1529
2220 DATA 5,101,208,1,200,152,160,
0,170,16,65,136,48,62,32,43,1431
2230 DATA 188,76,119,21,32,142,20,
177,20,133,101,132,100,169,128,133
,1691
2240 DATA 14,76,203,14,165,211,76,
138,21,166,101,208,25,165,100,133,
1816
2250 DATA 22,166,99,228,52,208,15,
165,98,197,51,208,9,24,101,97,1740
2260 DATA 133,51,144,2,230,52,165,
97,160,0,132,13,133,101,132,100,16
45
2270 DATA 169,128,133,14,76,201,14
,164,98,166,99,134,35,132,34,165,1
762
2280 DATA 101,208,25,165,100,133,2
2,165,97,240,221,228,52,208,13,196
,2174
2290 DATA 51,208,9,24,101,98,133,5
1,144,2,230,52,165,97,240,200,1805
2300 DATA 32,176,183,160,0,132,13,
132,14,76,203,14,165,14,48,92,1454
2310 DATA 165,97,208,4,133,100,240
,75,36,112,16,3,32,27,188,165,1601
2320 DATA 100,5,101,208,57,165,97,
201,129,144,51,233,144,16,47,201,1
899
2330 DATA 249,176,22,105,7,170,165
,99,208,36,165,98,232,240,6,74,205
2
2340 DATA 176,28,232,208,250,134,1
00,240,26,170,165,99,133,40,165,98
,2264
2350 DATA 74,102,40,176,9,232,208,
248,133,100,165,40,144,5,32,221,19
29
2360 DATA 189,208,12,133,101,36,10
2,16,3,32,201,13,32,29,9,132,1248
2370 DATA 109,133,81,133,110,133,1
08,169,107,133,80,132,14,136,200,1
85,1963
2380 DATA 0,1,208,250,132,97,76,20
3,23,165,14,16,7,165,100,240,1697
2390 DATA 6,76,72,178,32,211,20,16
9,1,133,97,133,14,165,51,164,1522
2400 DATA 52,56,233,1,176,1,136,19
6,50,208,2,197,49,176,3,32,1568
2410 DATA 122,31,133,51,132,52,133
,98,132,99,160,0,165,101,145,98,16
52
2420 DATA 76,12,24,165,14,16,8,166
,101,165,100,240,5,208,194,32,1526
2430 DATA 211,20,134,19,32,198,255
,132,59,76,203,14,132,19,32,228,17
64
2440 DATA 255,72,32,204,255,164,13
,48,26,104,201,48,144,4,201,58,182
9
2450 DATA 144,1,152,41,15,133,101,
132,100,36,14,48,3,76,45,19,1060
2460 DATA 76,76,19,104,240,22,164,
97,136,208,25,166,99,228,52,208,19
20
2470 DATA 4,166,98,228,51,144,13,1
45,98,76,172,14,166,97,240,249,196
1
2480 DATA 133,97,208,41,133,105,16
9,1,133,97,165,51,164,52,56,233,18
38
2490 DATA 1,176,1,136,196,50,208,2
,197,49,176,3,32,122,31,133,1513
2500 DATA 51,132,52,133,98,132,99,
165,105,160,0,145,98,76,179,19,164
4
2510 DATA 165,14,48,3,32,211,20,16
5,100,208,50,104,16,9,104,208,1457
2520 DATA 44,104,170,208,46,240,38
,104,48,35,104,56,233,137,16,29,16
12
2530 DATA 168,104,170,104,104,104,
138,200,240,25,74,200,208,252,170,
208,2469
2540 DATA 18,240,10,165,14,16,9,16
6,101,165,100,240,6,76,72,178,1576
2550 DATA 32,211,20,104,133,14,104
,133,80,104,133,81,208,4,165,80,16
06
2560 DATA 133,22,177,80,133,105,17
7,57,201,53,144,35,240,22,202,138,
1919
2570 DATA 133,110,162,0,24,229,105
,176,31,73,255,170,228,101,144,24,
1965
2580 DATA 166,101,176,20,138,24,22
9,105,73,255,144,10,152,176,5,152,
1926
2590 DATA 228,105,144,2,166,105,13
3,110,134,97,165,97,240,61,165,51,
2003
2600 DATA 164,52,56,229,97,176,1,1
36,196,50,208,2,197,49,176,3,1792
2610 DATA 32,122,31,133,98,133,51,
132,99,132,52,160,1,177,80,24,1457
2620 DATA 101,110,133,34,200,177,8
0,105,0,133,35,164,97,136,240,7,17
52
2630 DATA 177,34,145,98,136,208,24
9,177,34,145,98,166,22,224,31,176,
2120
2640 DATA 29,165,97,149,0,165,98,1
49,1,165,99,149,2,160,255,132,1815
2650 DATA 13,200,134,100,132,101,1
38,105,3,133,22,76,203,14,76,208,1
658
2660 DATA 180,134,60,32,142,20,32,
12,31,165,60,201,76,144,16,134,143
9
2670 DATA 73,208,4,162,0,240,3,32,
12,31,32,60,164,208,3,138,1390
2680 DATA 145,20,76,172,14,165,57,
105,0,133,122,165,58,105,0,133,147
0
2690 DATA 123,32,142,20,32,48,225,
76,133,14,134,60,177,65,16,5,1302
2700 DATA 162,42,76,55,164,170,165
,65,105,0,133,98,133,34,165,66,163
3
2710 DATA 105,0,133,99,133,35,56,1
38,101,65,133,65,144,2,230,66,1505
2720 DATA 134,97,70,60,176,3,76,17
9,19,138,32,176,183,36,14,48,1441
2730 DATA 3,76,48,19,76,207,18,166
,101,208,29,169,25,133,22,166,1466
2740 DATA 97,240,35,165,99,197,52,
208,15,165,98,197,51,208,9,24,1860
2750 DATA 101,97,133,51,144,2,230,
52,196,97,240,10,177,98,32,210,187
0
2760 DATA 255,200,196,97,208,246,7
6,86,25,165,14,48,93,208,200,165,2
282
2770 DATA 97,208,4,133,100,240,74,
36,112,16,3,32,27,188,165,100,1535
2780 DATA 5,101,208,56,165,97,16,5
2,56,233,144,16,47,201,249,176,182
2
2790 DATA 22,105,7,170,165,99,208,
36,165,98,232,240,6,74,176,28,1831
2800 DATA 232,208,250,134,100,240,
26,170,165,99,133,40,165,98,74,102
,2236
2810 DATA 40,176,9,232,208,248,133
,100,165,40,144,5,32,221,189,208,2
150
2820 DATA 12,133,101,36,102,16,3,3
2,201,13,32,29,9,162,0,189,1070
2830 DATA 0,1,240,6,32,210,255,232
,208,245,169,29,166,19,240,2,2054
2840 DATA 169,32,32,210,255,160,0,
177,57,201,61,144,58,208,61,165,19
90
2850 DATA 211,56,233,10,176,252,73
,255,105,1,16,23,134,60,165,14,178
4
2860 DATA 48,3,32,211,20,165,100,2
08,74,165,101,70,60,144,4,229,1634
2870 DATA 211,144,20,170,240,17,16
0,29,165,19,240,2,160,32,152,32,17
93
2880 DATA 210,255,202,208,249,160,
0,132,59,76,203,14,170,169,13,32,2
152
2890 DATA 210,255,165,19,16,5,169,
10,32,210,255,224,67,144,7,32,1820
2900 DATA 204,255,169,0,133,19,76,
172,14,165,14,240,9,166,101,165,19
02
2910 DATA 100,240,6,76,72,178,32,2
11,20,134,19,32,201,255,177,57,181
0
2920 DATA 201,68,176,200,132,59,76
,203,14,165,14,48,3,32,211,20,1622
2930 DATA 165,100,208,223,165,101,
32,195,255,176,3,76,172,14,201,240
,2326
2940 DATA 208,7,132,56,134,55,76,1
31,12,76,4,225,169,64,44,169,1562
2950 DATA 128,5,17,208,7,169,191,4
4,169,127,37,17,133,17,76,172,1517
2960 DATA 14,165,57,133,61,165,58,
133,62,76,172,14,134,60,165,19,148
8
2970 DATA 240,39,162,0,32,207,255,
201,13,240,11,157,0,2,232,224,2015
2980 DATA 89,208,241,76,113,165,16
9,0,157,0,2,168,165,144,41,3,1741
2990 DATA 208,17,173,0,2,208,46,24
0,217,32,249,171,160,0,173,0,1896
3000 DATA 2,208,34,132,67,32,183,1
```

```
71,76,172,14,134,60,164,67,185,170
1
3010 DATA 0,2,240,4,201,58,208,12,
165,19,208,182,152,240,233,32,1956
3020 DATA 69,171,208,213,200,185,0
,2,201,32,240,248,132,122,162,2,21
87
3030 DATA 134,123,36,13,48,95,32,1
21,0,32,243,188,164,122,185,0,1536
3040 DATA 2,240,22,201,58,240,18,2
01,44,240,14,32,98,171,165,61,1807
3050 DATA 164,62,133,57,132,58,76,
172,14,132,67,166,60,224,85,176,17
78
3060 DATA 27,166,19,240,7,32,204,2
55,169,0,133,19,170,240,13,0,1694
4000 PRINT "[CLEAR]NEW":PRINT"[DOW
N][DOWN]LOAD"+CHR$(34)+"BASIC LOAD
ER2"+CHR$(34
)+",8"
4010 REM CHANGE ,8 IN ABOVE LINE T
O ,1 FOR CASSETTE USE
4020 PRINT"[DOWN][DOWN][DOWN][DOWN
]RUN"
4030 POKE631,13:POKE632,13:POKE633
,13:POKE198,3:PRINT"[HOME]"
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PROGRAM:BASIC LOADER2

```
10 BL=299   :LN=70    :SA=6849
20 FOR L=0 TO BL:CX=0:FOR D=0 TO 1
5
30 READ A:IF A>255THENPRINT"NUMBER
 TO LARGE";LN+(L*10)
40 CX=CX+A:POKE SA+L*16+D,A:NEXT D
50 READ A:IF A><CX THENPRINT"ERROR
 IN LINE";LN+(L*10):STOP
60 NEXT L
70 DATA 0,185,252,172,240,6,32,210
,255,200,208,245,36,13,48,3,2105
80 DATA 76,158,24,164,97,240,11,16
9,0,133,101,169,105,133,100,76,175
6
90 DATA 123,19,76,179,19,134,107,1
32,106,170,240,36,201,34,208,24,18
08
100 DATA 230,106,230,122,200,185,0
,2,240,22,201,34,208,246,152,200,2
378
110 DATA 208,15,200,185,0,2,240,8,
201,58,240,4,201,44,208,242,2056
120 DATA 152,56,229,106,133,97,76,
143,26,134,60,138,105,146,133,61,1
795
130 DATA 162,5,134,85,160,239,173,
1,2,145,60,169,64,160,251,145,1955
140 DATA 60,174,2,2,169,1,32,90,27
,10,208,15,144,13,42,32,1021
150 DATA 90,27,48,7,202,240,11,201
,0,240,233,198,85,208,213,76,2079
160 DATA 157,14,197,101,208,245,76
,201,14,145,60,74,145,60,177,60,19
34
170 DATA 96,165,14,41,128,133,12,3
2,200,19,32,55,20,32,15,188,1182
180 DATA 76,145,27,169,1,166,14,48
,13,169,129,133,105,169,128,133,16
25
190 DATA 106,10,133,110,133,107,13
3,109,74,133,108,138,41,128,133,12
,1608
200 DATA 32,200,19,32,55,20,186,18
9,1,1,10,208,30,160,9,176,1328
210 DATA 2,160,16,132,11,165,74,22
1,3,1,208,5,165,73,221,2,1459
220 DATA 1,8,138,24,101,11,170,40,
208,221,154,186,224,64,176,3,1729
230 DATA 76,53,164,165,12,240,15,1
65,101,72,165,100,72,165,109,72,17
46
240 DATA 165,108,72,76,243,27,165,
102,9,127,37,98,133,98,169,234,186
3
250 DATA 160,27,133,34,132,35,76,6
7,174,32,252,187,32,43,188,32,1604
260 DATA 56,174,165,58,72,165,57,7
2,165,74,72,165,73,72,165,12,1617
270 DATA 72,76,172,14,105,8,170,20
8,1,186,165,74,221,3,1,208,1684
280 DATA 7,165,73,221,2,1,240,28,1
89,1,1,10,208,8,138,176,1468
290 DATA 227,105,16,170,208,228,76
,48,173,186,189,3,1,133,74,189,202
6
300 DATA 2,1,133,73,189,1,1,10,208
,236,154,200,176,38,138,105,1665
310 DATA 6,72,105,6,133,36,104,32,
162,187,186,189,11,1,133,102,1465
320 DATA 133,12,165,73,164,74,32,1
03,184,32,208,187,160,1,32,93,1653
330 DATA 188,76,168,28,189,7,1,24,
113,73,145,73,133,101,132,12,1463
340 DATA 136,189,6,1,16,2,132,12,1
13,73,145,73,133,100,189,9,1329
350 DATA 1,168,189,8,1,197,100,208
,4,196,101,240,32,160,0,69,1674
360 DATA 100,48,39,176,2,160,1,196
,12,208,18,138,105,8,170,154,1535
370 DATA 160,0,132,59,76,203,14,56
,186,229,12,240,17,189,5,1,1579
380 DATA 133,58,189,4,1,133,57,76,
172,14,176,217,144,217,138,24,1753
390 DATA 105,16,170,154,160,0,132,
59,76,203,14,132,59,165,14,16,1475
400 DATA 11,165,100,5,101,208,68,1
69,2,76,191,14,165,97,208,59,1639
410 DATA 240,245,132,59,200,134,60
,165,14,240,7,165,100,240,6,76,208
3
420 DATA 72,178,32,211,20,177,57,1
70,165,101,240,5,10,209,57,144,184
8
430 DATA 4,138,76,188,14,168,70,60
,176,18,136,138,208,2,169,2,1567
440 DATA 101,57,72,165,58,105,0,72
,169,141,72,200,177,57,170,200,181
6
450 DATA 177,57,133,57,134,58,160,
0,76,207,14,105,15,170,154,104,162
1
460 DATA 201,141,240,30,10,208,8,1
86,138,144,240,105,7,208,238,76,21
80
470 DATA 224,168,104,133,73,104,13
3,74,104,145,73,200,192,5,208,248,
2188
480 DATA 160,0,104,133,58,104,133,
57,76,207,14,132,59,165,14,16,1432
490 DATA 9,165,100,5,101,208,200,7
6,203,14,165,97,208,193,76,203,202
3
500 DATA 14,132,59,165,14,16,11,16
5,100,5,101,240,9,169,1,76,1277
510 DATA 191,14,165,97,208,247,200
,177,57,76,188,14,200,177,57,24,20
92
520 DATA 101,45,133,100,200,177,57
,101,46,133,101,200,177,57,101,45,
1774
530 DATA 133,108,200,177,57,101,46
,133,109,169,5,101,57,133,106,165,
1800
540 DATA 58,105,0,133,107,185,106,
0,145,100,136,16,248,160,5,208,171
2
550 DATA 198,160,2,177,57,24,101,4
5,133,71,136,177,57,101,46,133,161
8
560 DATA 72,165,57,105,3,72,165,58
,105,0,72,177,71,208,3,76,1409
570 DATA 174,179,133,58,136,177,71
,133,57,160,2,177,71,133,73,200,19
34
580 DATA 177,71,133,74,200,177,73,
72,136,16,250,165,74,72,165,73,192
8
590 DATA 72,165,14,76,43,19,200,17
7,57,132,12,133,11,200,177,57,1545
600 DATA 133,69,200,177,57,133,70,
165,49,133,95,229,47,133,105,165,1
960
610 DATA 50,133,96,229,48,170,5,10
5,240,33,160,5,24,177,57,101,1633
620 DATA 47,133,107,136,177,57,101
,48,133,108,160,1,177,107,136,17,1
645
630 DATA 107,208,88,165,105,145,10
7,200,138,145,107,32,148,177,32,8,
1912
640 DATA 164,160,0,132,59,132,114,
162,5,165,69,145,95,16,1,202,1621
650 DATA 200,165,70,145,95,16,2,20
2,202,134,113,165,11,160,4,145,182
9
660 DATA 95,208,3,32,200,19,32,142
,20,200,232,208,3,24,105,1,1524
670 DATA 145,95,200,138,145,95,32,
76,179,164,34,134,113,133,114,198,
1995
680 DATA 11,208,224,32,170,178,169
,6,76,188,14,76,77,178,200,132,193
9
690 DATA 10,32,223,30,70,12,170,24
0,21,32,90,226,198,11,240,14,1619
700 DATA 32,2,31,134,186,198,11,24
0,5,32,2,31,134,185,32,197,1452
710 DATA 30,76,172,14,165,60,201,9
4,144,5,208,15,76,89,225,165,1739
720 DATA 185,208,2,230,185,169,167
,72,169,173,72,76,111,225,134,60,2
238
730 DATA 160,1,162,0,134,183,134,2
3,134,185,134,144,132,12,132,186,1
856
740 DATA 132,123,169,25,133,22,177
,57,133,11,230,57,208,2,230,58,176
7
750 DATA 96,70,12,144,6,76,200,20,
76,72,178,104,24,105,1,133,1317
760 DATA 69,104,105,0,133,70,104,1
6,10,104,208,236,104,133,101,170,1
667
770 DATA 108,69,0,104,48,226,104,5
6,233,137,16,220,168,104,170,104,1
867
780 DATA 104,104,138,200,240,231,7
4,200,208,252,240,225,32,223,30,32
,2533
790 DATA 2,31,134,184,198,11,240,3
2,32,2,31,134,186,224,3,144,1588
800 DATA 2,198,185,198,11,240,17,3
2,2,31,134,185,198,11,240,8,1692
810 DATA 32,200,19,198,13,32,90,22
6,32,192,255,176,3,76,172,14,1730
820 DATA 76,239,25,234,234,234,76,
8,175,32,38,181,165,51,164,52,1984
830 DATA 56,229,97,176,1,136,196,5
0,208,2,197,49,144,1,96,76,1714
840 DATA 53,164,13,63,184,64,184,6
4,159,31,167,31,245,32,185,16,1655
850 DATA 1,218,170,0,0,22,4,84,69,
88,84,8,71,82,65,80,1046
860 DATA 72,73,67,83,4,80,76,79,84
,6,85,78,80,76,79,84,1106
870 DATA 4,68,82,65,87,6,85,78,68,
82,65,87,6,67,73,82,1005
880 DATA 67,76,69,8,85,78,67,73,82
,67,76,69,4,77,79,86,1063
890 DATA 69,4,84,85,82,78,5,82,69,
83,69,84,6,66,79,82,1027
900 DATA 68,69,82,3,73,78,75,5,80,
65,80,69,82,4,76,73,982
910 DATA 78,69,4,77,79,68,69,3,67,
76,82,6,83,80,82,73,996
920 DATA 84,69,2,73,83,2,79,78,3,7
9,70,70,1,40,7,69,809
930 DATA 88,80,65,78,68,89,7,69,88
,80,65,78,68,88,9,67,1087
940 DATA 79,78,84,82,65,67,84,89,9
,67,79,78,84,82,65,67,1159
950 DATA 84,88,6,67,79,76,79,85,82
,1,84,1,65,1,87,1,886
960 DATA 74,1,85,1,83,1,77,1,71,1,
78,1,73,1,66,1,615
970 DATA 67,1,69,1,68,1,80,1,76,4,
82,85,78,50,5,76,744
980 DATA 73,83,84,50,5,69,88,73,84
,52,5,70,82,69,69,50,1006
990 DATA 4,78,69,87,51,5,65,85,84,
79,50,6,82,69,83,69,966
1000 DATA 84,53,6,68,76,79,65,68,5
0,8,68,86,69,82,73,70,1005
1010 DATA 89,50,6,68,83,65,86,69,5
0,8,67,65,84,65,76,79,1010
1020 DATA 71,50,5,75,73,76,76,52,5
,68,85,77,80,50,9,67,919
1030 DATA 79,78,84,73,78,85,69,50,
3,76,207,50,7,76,65,66,1146
1040 DATA 76,69,83,50,6,80,76,73,8
3,84,50,8,68,65,80,80,1031
1050 DATA 69,78,68,50,8,82,69,80,7
5,65,67,69,50,5,70,73,979
1060 DATA 78,68,50,255,21,231,42,1
47,17,42,42,42,42,32,67,79,1255
1070 DATA 77,77,79,68,79,82,69,32,
54,52,32,32,77,73,75,82,1040
1080 DATA 79,32,80,73,76,79,84,32,
86,54,46,52,32,42,42,42,931
1090 DATA 42,62,231,20,32,32,32,32
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,54,52,75,32,82,65,77,32,952
1100 DATA 83,89,83,84,69,77,32,145
,60,166,255,167,2,138,23,177,1650
1110 DATA 192,186,193,178,194,170,
166,180,10,195,168,144,64,0,0,0,20
40
1120 DATA 196,166,80,197,166,50,19
8,168,128,0,0,0,0,199,168,144,1860
1130 DATA 64,109,0,0,200,166,69,20
1,240,202,241,203,168,144,64,241,2
312
1140 DATA 0,0,204,140,180,7,205,17
7,206,231,13,32,32,32,32,32,1523
1150 DATA 32,32,32,32,32,32,32,32,
207,231,13,63,63,63,63,63,1022
1160 DATA 63,63,63,63,63,63,63,63,
208,184,209,129,16,1,195,128,1574
1170 DATA 0,7,129,16,1,204,128,0,9
,129,16,1,206,128,0,11,985
1180 DATA 145,16,1,83,208,0,13,189
,51,210,166,34,51,211,166,200,1744
1190 DATA 16,1,76,128,0,15,245,16,
1,67,128,0,17,191,16,1,918
1200 DATA 73,128,0,19,139,16,1,71,
128,0,21,249,16,1,77,128,1067
1210 DATA 0,23,249,128,16,2,86,128
,0,25,149,212,139,160,20,17,1354
1220 DATA 148,164,21,74,19,149,212
,145,160,20,17,148,164,13,74,19,15
47
1230 DATA 149,212,138,128,8,160,20
,17,148,164,19,74,19,149,212,243,1
860
1240 DATA 160,20,17,148,164,17,74,
19,149,149,236,84,73,77,69,228,168
4
1250 DATA 25,149,128,175,228,25,23
4,17,157,60,148,36,60,231,10,66,17
49
1260 DATA 89,84,69,83,32,70,82,69,
69,62,25,42,129,239,17,82,1243
1270 DATA 69,65,68,89,46,62,149,36
,166,80,4,82,44,179,149,128,1416
1280 DATA 175,228,25,149,214,26,35
,207,25,60,240,149,212,151,128,2,2
026
1290 DATA 82,42,76,153,47,216,148,
164,17,128,53,49,218,153,154,52,17
52
1300 DATA 148,164,17,154,52,2,82,3
4,135,148,128,7,212,148,244,4,1679
1310 DATA 82,34,100,25,42,76,148,1
28,7,212,148,27,28,34,187,34,1312
1320 DATA 241,38,150,34,39,38,107,
35,103,35,185,38,164,40,25,36,1308
1330 DATA 56,37,50,37,212,47,118,1
48,189,8,27,16,48,41,38,164,1236
1340 DATA 49,213,50,8,50,18,51,137
,52,106,149,219,128,215,176,212,18
33
1350 DATA 156,160,20,17,156,149,23
2,228,25,156,128,232,228,25,160,20
,2092
1360 DATA 20,176,220,155,128,7,219
,155,142,2,82,44,199,153,70,153,19
25
1370 DATA 233,3,2,82,62,58,155,164
,15,217,26,41,118,25,34,212,1447
1380 DATA 26,53,255,157,128,14,2,8
2,42,129,154,128,2,31,9,180,1392
1390 DATA 128,96,2,25,35,51,158,12
9,10,212,157,129,10,160,20,17,1339
1400 DATA 148,129,9,48,217,26,49,1
88,153,60,180,65,148,164,15,62,166
1
1410 DATA 26,49,188,153,70,153,233
,3,5,31,6,19,25,42,129,25,1157
1420 DATA 62,58,128,66,146,67,158,
129,10,212,157,129,10,160,20,17,15
29
1430 DATA 148,129,9,48,233,32,7,14
8,164,15,7,217,26,49,188,128,1548
1440 DATA 66,153,67,153,70,153,233
,3,5,31,10,19,128,97,149,218,1555
1450 DATA 25,42,129,25,35,48,128,2
12,153,47,216,153,148,128,54,49,15
92
1460 DATA 149,2,31,21,148,128,7,21
2,148,152,128,7,4,34,27,4,1202
1470 DATA 35,108,129,223,25,35,146
,153,153,47,148,128,8,8,53,49,1448
1480 DATA 223,128,224,32,25,34,79,
153,47,224,33,160,33,166,198,23,17
82
1490 DATA 128,212,160,33,160,20,17
,153,148,128,54,50,167,2,119,148,1
699
1500 DATA 7,128,8,23,160,20,20,29,
21,25,32,246,130,166,198,23,1236
1510 DATA 166,62,167,2,120,23,166,
160,167,2,121,23,128,214,160,32,17
13
1520 DATA 31,18,159,48,233,32,7,21
7,26,49,188,26,35,152,159,129,1509
1530 DATA 7,223,132,24,58,167,3,25
5,46,128,8,224,33,232,217,149,1906
1540 DATA 212,167,2,0,148,7,46,51,
224,34,153,160,34,7,217,148,1610
1550 DATA 128,7,212,148,160,33,128
,7,4,82,35,242,160,35,128,2,1511
1560 DATA 31,12,180,128,96,2,128,6
6,153,67,128,97,150,31,10,26,1305
1570 DATA 49,188,26,49,188,149,214
,26,51,28,153,232,2,160,36,12,1563
1580 DATA 82,35,189,149,224,35,29,
26,58,144,153,128,53,224,37,160,17
26
1590 DATA 37,233,48,2,160,37,233,4
9,2,13,82,36,81,232,224,37,1506
1600 DATA 160,38,47,216,152,149,2,
142,128,2,13,31,31,231,22,78,1442
1610 DATA 79,78,45,69,88,73,83,84,
65,78,84,32,70,73,76,69,1146
1620 DATA 32,78,65,77,69,224,39,25
,42,85,152,189,1,31,27,231,1367
1630 DATA 18,70,73,76,69,32,78,65,
77,69,32,84,79,79,32,76,1009
1640 DATA 79,78,71,224,39,25,42,85
,63,231,8,68,83,65,86,73,1320
1650 DATA 78,71,32,60,160,38,60,23
1,9,32,79,78,32,68,73,83,1184
1660 DATA 75,32,60,160,37,62,160,3
8,143,7,189,52,235,80,76,84,1490
1670 DATA 7,217,233,64,160,37,7,23
3,58,7,153,7,128,184,128,96,1719
1680 DATA 4,63,26,50,252,128,66,14
2,67,128,66,160,38,60,146,60,1456
1690 DATA 69,128,212,142,128,8,160
,20,17,148,129,9,48,233,32,7,1490
1700 DATA 148,164,15,7,217,26,49,1
88,153,62,128,66,148,164,15,60,161
0
1710 DATA 146,60,69,153,70,153,233
,3,2,31,7,128,97,25,62,58,1297
1720 DATA 19,128,97,63,147,60,160,
38,60,147,60,231,13,32,78,79,1412
1730 DATA 87,32,79,78,32,68,73,83,
75,32,60,160,37,62,25,42,1025
1740 DATA 129,149,224,40,149,218,2
32,217,234,36,48,149,184,128,96,4,
2237
1750 DATA 177,72,160,37,70,177,72,
160,37,70,177,72,160,37,70,177,172
5
1760 DATA 72,160,37,70,233,32,60,1
60,34,60,233,32,60,177,212,252,188
4
1770 DATA 160,20,17,128,72,160,34,
70,160,34,60,19,63,177,72,160,1406
1780 DATA 41,70,177,72,160,41,70,1
28,72,160,37,70,160,37,232,2,1529
1790 DATA 31,6,176,51,224,37,160,3
7,50,221,177,212,252,160,20,17,183
1
1800 DATA 177,72,160,34,70,160,34,
232,2,31,6,176,51,224,34,153,1616
1810 DATA 160,34,7,217,19,177,72,1
60,41,70,153,130,177,54,233,66,177
0
1820 DATA 5,31,11,157,60,153,62,23
2,217,25,37,110,153,177,52,50,1532
1830 DATA 223,26,49,188,159,167,1,
0,9,157,7,60,153,62,177,97,1535
1840 DATA 25,42,129,153,224,38,231
,17,17,65,82,69,32,89,79,85,1377
1850 DATA 32,67,69,82,84,65,73,78,
32,60,26,35,189,153,128,52,1225
1860 DATA 233,89,5,82,42,129,160,3
8,217,26,58,144,153,128,53,49,1606
1870 DATA 224,33,160,38,232,2,31,2
1,231,12,78,79,32,70,73,76,1392
1880 DATA 69,32,78,65,77,69,224,39
,25,42,85,160,38,128,53,233,1417
1890 DATA 42,2,31,28,160,38,160,38
,47,128,8,52,144,7,224,38,1147
1900 DATA 160,38,189,52,235,80,76,
84,7,224,38,25,38,77,160,38,1521
1910 DATA 143,7,217,153,189,52,235
,80,76,84,7,217,191,184,128,96,205
9
1920 DATA 3,26,50,252,128,66,233,8
3,160,33,48,7,233,58,7,153,1540
1930 DATA 7,67,26,50,252,128,97,25
,42,129,149,212,142,160,20,17,1523
1940 DATA 148,232,228,15,160,20,20
,128,206,149,212,156,160,20,17,148
,2019
1950 DATA 149,232,228,25,148,128,2
32,228,25,19,128,220,149,224,42,14
9,2326
1960 DATA 224,42,25,42,129,63,231,
9,66,65,83,73,67,32,79,75,1305
1970 DATA 46,62,79,128,218,237,68,
76,79,65,68,224,39,26,58,144,1617
1980 DATA 153,128,53,224,37,160,37
,233,48,2,160,37,233,49,2,13,1569
1990 DATA 82,38,199,232,224,37,160
,38,47,216,152,149,2,31,31,231,186
9
2000 DATA 22,78,79,78,45,69,88,73,
83,84,65,78,84,32,70,73,1101
2010 DATA 76,69,32,78,65,77,69,224
,39,25,42,85,152,189,1,31,1254
2020 DATA 27,231,18,70,73,76,69,32
,78,65,77,69,32,84,79,79,1159
2030 DATA 32,76,79,78,71,224,39,25
,42,85,160,38,128,53,233,42,1405
2040 DATA 2,31,25,160,38,160,38,47
,177,8,52,144,7,217,153,189,1448
2050 DATA 52,235,80,76,84,7,217,25
,39,55,160,38,144,7,189,52,1460
2060 DATA 235,80,76,84,7,217,160,3
7,233,58,7,153,7,149,184,128,1815
2070 DATA 96,4,26,50,252,128,72,16
0,22,83,63,128,72,160,38,83,1437
2080 DATA 154,128,2,31,7,150,206,2
5,39,97,142,150,7,128,8,206,1480
2090 DATA 160,39,60,236,73,78,71,3
2,60,160,38,60,231,10,32,79,1419
2100 DATA 70,70,32,68,73,83,75,32,
60,160,37,62,63,154,212,142,1393
2110 DATA 128,8,160,20,17,148,232,
228,15,153,70,153,233,3,2,128,1698
2120 DATA 164,15,235,82,85,78,5,12
,31,9,128,97,148,206,25,62,1382
2130 DATA 58,128,72,160,34,70,160,
34,146,2,128,164,15,235,82,85,1573
2140 DATA 78,5,12,31,19,148,129,9,
48,233,32,7,148,164,15,7,1085
2150 DATA 217,26,49,188,153,62,160
,34,146,2,31,8,160,20,20,25,1301
2160 DATA 39,223,148,148,164,15,16
0,34,7,228,15,25,39,162,128,97,163
2
2170 DATA 63,147,60,160,38,60,147,
60,233,32,60,160,39,60,231,11,1561
2180 DATA 69,68,32,79,70,70,32,68,
73,83,75,60,160,37,62,128,1166
2190 DATA 164,15,235,82,85,78,2,31
,14,128,224,43,160,43,219,160,1683
2200 DATA 43,215,25,34,212,25,42,1
29,26,58,144,153,128,53,224,37,154
8
2210 DATA 160,37,233,48,2,160,37,2
33,49,2,13,82,40,50,232,224,1602
2220 DATA 37,160,38,47,216,152,149
,2,31,31,231,22,78,79,78,45,1396
2230 DATA 69,88,73,83,84,65,78,84,
32,70,73,76,69,32,78,65,1119
2240 DATA 77,69,224,39,25,42,85,15
2,189,1,31,27,231,18,70,73,1353
2250 DATA 76,69,32,78,65,77,69,32,
84,79,79,32,76,79,78,71,1076
2260 DATA 224,39,25,42,85,160,38,1
28,53,233,42,2,31,25,160,38,1325
2270 DATA 160,38,47,177,8,52,144,7
,217,153,189,52,235,80,76,84,1719
2280 DATA 7,217,25,40,162,160,38,1
43,7,189,52,235,80,76,84,7,1522
2290 DATA 217,160,37,233,58,7,153,
7,149,184,128,96,4,26,50,252,1761
2300 DATA 128,72,160,26,83,63,128,
72,160,38,83,154,142,5,82,41,1437
2310 DATA 100,231,11,68,86,69,82,7
3,70,89,73,78,71,32,60,160,1353
2320 DATA 38,60,231,9,32,79,78,32,
68,73,83,75,32,60,160,37,1147
2330 DATA 62,63,128,212,154,128,8,
160,20,17,232,224,34,153,70,153,18
18
2340 DATA 233,3,2,31,7,128,97,25,6
2,58,128,72,153,70,153,146,1368
2350 DATA 5,31,11,160,34,153,7,224
,34,25,40,251,148,164,15,160,1462
2360 DATA 34,2,31,25,148,129,9,48,
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233,32,7,148,164,15,7,217,1249
2370 DATA 26,49,188,153,62,160,20,
20,25,41,49,154,212,25,41,100,1325
2380 DATA 128,97,160,38,233,42,2,3
1,8,233,157,224,38,232,211,63,1897
2390 DATA 147,60,160,38,60,147,60,
231,15,32,73,83,32,79,75,32,1324
2400 DATA 79,78,32,68,73,83,75,32,
60,160,37,62,166,34,51,211,1301
2410 DATA 25,42,129,231,9,80,82,79
,71,82,65,77,77,69,224,39,1381
2420 DATA 128,97,25,42,85,153,128,
53,233,93,2,31,5,26,49,196,1346
2430 DATA 149,149,236,84,73,77,69,
228,25,149,128,175,228,25,153,130,
2078
2440 DATA 128,54,233,58,2,82,41,23.
8,153,128,52,224,41,160,41,233,186
8
2450 DATA 58,2,160,44,232,5,12,82,
41,246,160,41,233,42,2,82,1442
2460 DATA 42,129,160,41,233,91,2,8
2,53,24,153,130,130,54,224,41,1589
2470 DATA 160,41,234,78,58,2,160,4
5,128,2,12,160,41,234,89,58,1502
2480 DATA 2,160,45,149,2,12,13,82,
42,129,160,41,234,89,58,2,1220
2490 DATA 160,41,234,78,58,2,13,82
,41,238,25,53,73,153,128,52,1431
2500 DATA 224,44,26,49,188,153,128
,52,233,58,2,31,8,26,49,188,1459
2510 DATA 25,42,10,26,49,188,25,41
,246,149,212,160,44,148,164,19,154
8
2520 DATA 2,82,42,34,148,128,7,212
,148,138,4,82,42,12,25,42,1148
2530 DATA 76,148,128,7,27,28,42,17
6,42,245,43,143,44,15,44,111,1319
2540 DATA 44,199,44,221,46,99,46,2
30,46,254,47,111,48,245,49,204,193
3
2550 DATA 148,188,8,27,8,47,152,50
,13,52,213,238,83,89,78,84,1478
2560 DATA 65,88,224,39,233,17,60,1
60,39,60,231,8,32,69,82,82,1489
2570 DATA 79,82,32,63,60,151,149,2
,31,6,63,25,44,199,231,8,1225
2580 DATA 32,73,78,32,76,73,78,69,
60,155,129,9,62,25,44,199,1194
2590 DATA 155,164,15,217,153,128,5
3,233,93,5,82,42,169,160,46,149,18
64
2600 DATA 2,82,53,217,160,42,164,7
,219,160,42,128,8,224,42,160,1710
2610 DATA 42,149,2,31,5,149,224,46
,151,128,2,88,25,34,62,149,1287
2620 DATA 224,36,233,32,153,7,217,
153,128,53,233,59,2,31,8,26,1595
2630 DATA 49,196,128,224,36,26,48,
72,26,49,188,150,128,2,31,8,1361
2640 DATA 180,128,96,2,128,66,160,
36,128,2,31,10,153,60,149,224,1553
2650 DATA 36,25,42,231,153,62,150,
128,2,31,8,128,68,128,97,149,1438
2660 DATA 214,25,42,129,149,224,36
,149,224,35,153,128,53,233,59,2,18
55
2670 DATA 31,8,128,224,36,26,49,19
6,153,128,53,233,33,2,31,8,1339
2680 DATA 128,224,35,26,49,196,153
,128,53,233,36,5,82,42,76,153,1619
2690 DATA 153,47,128,8,52,224,47,2
6,35,189,149,212,160,47,236,84,179
7
2700 DATA 73,77,69,2,153,47,182,2,
12,31,7,153,86,25,42,129,1090
2710 DATA 148,149,164,25,160,47,2,
31,10,148,128,153,228,25,25,42,148
5
2720 DATA 129,148,128,7,212,148,15
6,128,7,4,82,43,65,156,128,7,1548
2730 DATA 220,156,249,1,82,43,118,
156,149,160,47,228,25,156,128,153,
2071
2740 DATA 228,25,25,42,129,231,18,
84,79,79,32,77,65,78,89,32,1313
2750 DATA 86,65,82,73,65,66,76,69,
83,224,39,25,42,85,153,128,1361
2760 DATA 53,233,36,5,82,42,76,153
,153,47,128,8,52,224,47,149,1488
2770 DATA 212,148,149,164,25,160,4
7,2,82,43,187,148,128,7,212,148,18
62
2780 DATA 156,128,7,4,82,43,162,25
,43,248,148,128,232,228,25,148,180
7
2790 DATA 149,232,228,25,148,128,7
,224,48,160,48,128,8,149,160,48,18
90
2800 DATA 149,164,25,228,25,160,48
,128,8,128,160,48,128,164,25,228,1
816
2810 DATA 25,160,48,128,7,224,48,1
60,48,156,128,7,4,82,43,202,1470
2820 DATA 156,128,8,220,25,42,129,
231,16,78,79,32,83,85,67,72,1451
2830 DATA 32,86,65,82,73,65,66,76,
69,224,39,25,42,76,128,215,1363
2840 DATA 153,49,216,152,149,2,82,
44,50,152,129,10,216,152,152,33,17
41
2850 DATA 2,152,142,4,12,31,9,152,
128,8,219,25,42,129,25,44,1124
2860 DATA 79,128,212,153,128,52,23
3,42,5,82,42,76,148,164,15,224,178
3
2870 DATA 34,153,160,34,2,31,9,148
,128,8,219,25,42,129,148,128,1398
2880 DATA 7,212,148,142,4,82,44,61
,231,15,76,65,66,69,76,32,1330
2890 DATA 78,79,84,32,70,79,85,78,
68,224,39,25,42,85,160,49,1277
2900 DATA 160,49,164,11,128,8,228,
11,160,49,164,11,149,2,82,44,1420
2910 DATA 138,160,49,164,9,219,25,
42,129,160,49,128,8,224,49,160,171
3
2920 DATA 49,149,4,82,44,154,25,42
,129,231,18,85,78,84,73,76,1323
2930 DATA 32,87,73,84,72,79,85,84,
32,76,79,79,80,224,39,25,1230
2940 DATA 42,85,231,13,79,85,84,32
,79,70,32,77,69,77,79,82,1216
2950 DATA 89,224,39,25,42,85,160,4
3,128,2,31,10,149,224,43,149,1443
2960 DATA 215,25,38,107,149,215,15
1,224,42,25,34,62,149,224,50,26,17
36
2970 DATA 54,142,160,47,149,51,7,2
24,47,153,128,52,233,40,5,82,1574
2980 DATA 45,25,26,61,208,160,37,4
9,34,221,160,41,49,34,223,160,1533
2990 DATA 47,47,216,159,152,1,34,1
59,157,7,152,1,34,7,82,46,1301
3000 DATA 202,160,47,159,157,54,22
4,47,153,128,52,233,43,2,31,8,1700
3010 DATA 128,224,51,25,45,56,153,
128,52,233,47,2,31,8,149,224,1556
3020 DATA 51,25,45,56,25,42,76,26,
49,188,26,48,72,153,232,2,1116
3030 DATA 82,45,126,128,212,160,50
,249,1,82,46,76,148,153,47,2,1607
3040 DATA 82,45,126,153,148,128,54
,233,44,2,31,28,160,50,153,128,156
5
3050 DATA 148,128,8,54,228,23,160,
50,128,7,224,50,153,153,47,148,170
9
3060 DATA 8,53,217,25,45,68,148,12
8,7,212,25,45,77,160,50,0,1268
4000 PRINT "[CLEAR]NEW":PRINT"[DOW
N][DOWN]LOAD"+CHR$(34)+"BASIC LOAD
ER3"+CHR$(34
)+",8"
4010 REM CHANGE ,8 IN ABOVE LINE T
O ,1 FOR CASSETTE USE
4020 PRINT"[DOWN][DOWN][DOWN][DOWN
]RUN"
4030 POKE631,13:POKE632,13:POKE633
,13:POKE198,3:PRINT"[HOME]"
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PROGRAM:BASIC LOADER3

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10 BL=307  :LN=70   :SA=11649
20 FOR L=0 TO BL:CX=0:FOR D=0 TO 1
5
30 READ A:IF A>255THENPRINT"NUMBER
 TO LARGE";LN+(L*10)
40 CX=CX+A:POKE SA+L*16+D,A:NEXT D
50 READ A:IF A><CX THENPRINT"ERROR
 IN LINE";LN+(L*10)
60 NEXT L
70 DATA 228,23,160,51,128,2,82,45,
236,149,212,148,160,50,128,7,1809
80 DATA 2,31,8,149,224,45,25,42,12
9,148,164,23,160,47,2,31,1230
90 DATA 8,128,224,45,25,42,129,148
,164,23,47,216,152,160,47,47,1605
100 DATA 3,31,9,148,128,7,212,25,4
5,140,128,224,48,160,47,47,1402
110 DATA 152,8,218,160,47,160,48,1
52,54,148,164,23,2,31,8,128,1503
120 DATA 224,45,25,42,129,160,48,1
28,7,224,48,160,48,154,128,7,1577
130 DATA 4,82,45,196,148,128,7,212
,25,45,140,149,212,148,164,23,1728
140 DATA 47,216,148,160,50,128,7,2
,31,8,128,224,45,25,42,129,1390
150 DATA 160,47,148,164,23,2,31,9,
148,128,7,212,25,45,238,152,1539
160 DATA 160,47,47,3,31,8,149,224,
45,25,42,129,128,224,48,160,1470
170 DATA 47,47,218,160,47,160,48,1
52,54,148,164,23,2,31,9,148,1458
180 DATA 128,7,212,25,45,238,160,4
8,128,7,224,48,160,48,154,128,1760
190 DATA 7,4,82,46,36,149,224,45,2
5,42,129,231,16,84,79,79,1278
200 DATA 32,77,65,78,89,32,77,65,8
4,67,72,69,83,224,39,25,1178
210 DATA 42,85,26,48,72,25,54,214,
153,232,2,82,42,129,149,224,1579
220 DATA 36,153,128,52,233,40,2,31
,5,26,46,171,153,128,52,166,1422
230 DATA 34,51,2,31,5,26,49,188,15
3,128,53,233,59,2,31,8,1053
240 DATA 128,224,36,26,49,196,153,
128,53,166,34,51,2,31,5,26,1308
250 DATA 49,196,233,32,153,7,217,2
5,42,198,26,61,208,26,48,72,1593
260 DATA 26,51,43,26,55,51,159,166
,198,23,248,157,8,166,216,23,1616
270 DATA 168,144,96,127,0,0,24,58,
29,231,21,86,65,82,73,65,1269
280 DATA 66,76,69,32,79,85,84,32,7
9,70,32,82,65,78,71,69,1069
290 DATA 224,39,25,42,85,149,212,1
56,160,20,17,148,149,232,228,25,19
11
300 DATA 148,128,232,228,25,160,20
,20,149,220,25,42,129,153,128,53,1
860
310 DATA 233,59,2,31,8,128,224,36,
26,49,196,153,128,53,233,36,1595
320 DATA 5,82,42,76,153,153,47,128
,8,52,224,47,153,70,160,36,1436
330 DATA 153,232,2,12,82,47,29,153
,233,3,2,82,62,58,160,36,1346
340 DATA 128,2,31,5,149,224,36,128
,212,148,149,164,25,160,47,2,1610
350 DATA 31,10,148,128,153,228,25,
25,42,129,148,128,7,212,148,156,17
18
360 DATA 128,7,4,82,47,58,156,128,
7,220,156,249,1,82,43,118,1486
370 DATA 156,149,160,47,228,25,156
,128,153,228,25,25,42,129,155,128,
1934
380 DATA 7,219,25,62,58,236,78,65,
77,69,61,237,86,65,76,85,1506
390 DATA 69,62,63,149,212,156,160,
20,17,148,149,164,25,61,148,128,17
31
400 DATA 164,25,62,19,25,42,129,15
3,233,58,7,217,149,218,151,128,178
0
410 DATA 2,31,4,128,218,128,215,23
3,36,224,39,128,221,26,48,5,1686
420 DATA 153,148,128,8,52,224,47,1
53,152,148,8,53,217,153,130,52,182
6
430 DATA 233,61,147,7,2,31,8,26,49
,188,26,49,188,147,233,58,1453
440 DATA 7,224,39,130,221,26,48,5,
153,152,148,128,7,8,53,224,1573
450 DATA 34,153,148,128,8,52,217,2
6,43,43,148,152,2,160,34,232,1580
460 DATA 2,13,31,12,154,128,2,34,2
15,149,218,25,42,129,160,34,1348
470 DATA 217,25,47,168,128,212,153
,47,216,153,148,157,54,160,39,2,19
26
480 DATA 88,148,128,7,212,148,152,
128,7,4,82,48,10,154,128,2,1446
490 DATA 34,215,26,49,196,25,42,12
9,155,149,2,31,19,231,10,87,1400
500 DATA 72,69,82,69,32,70,82,79,7
7,224,39,25,42,85,128,215,1390
510 DATA 155,128,8,219,25,34,212,1
53,149,51,7,217,128,212,153,47,189
8
520 DATA 216,153,148,128,54,233,36
,2,31,5,26,48,108,148,128,7,1471
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530 DATA 212,148,152,6,82,48,79,26,49,196,29,149,224,48,160,48,1656
540 DATA 149,164,25,224,34,160,34,47,218,160,48,156,128,7,2,88,1644
550 DATA 154,152,3,154,148,3,13,31,11,160,48,128,7,224,48,25,1309
560 DATA 48,111,148,154,8,149,6,31,6,154,128,7,212,148,154,8,1472
570 DATA 224,33,160,48,149,164,25,153,160,33,154,54,5,31,11,160,1564
580 DATA 48,128,7,224,48,25,48,111,160,48,128,164,25,224,37,26,1451
590 DATA 50,53,153,224,34,160,37,217,26,51,28,153,224,37,160,34,1641
600 DATA 217,152,148,8,224,33,154,128,7,222,160,37,153,160,33,53,1889
610 DATA 7,224,34,153,148,158,8,52,160,34,7,217,160,48,128,164,1702
620 DATA 25,47,218,29,128,224,51,26,54,142,149,224,51,153,128,52,1701
630 DATA 233,61,5,82,42,76,26,49,188,26,48,72,128,212,153,47,1448
640 DATA 216,153,148,128,54,224,34,160,34,233,47,2,160,34,233,43,1903
650 DATA 2,13,160,34,233,42,2,13,160,34,233,45,2,13,82,49,1117
660 DATA 71,148,128,7,212,148,152,128,7,4,82,49,18,160,40,128,1482
670 DATA 153,228,25,25,42,129,153,148,128,8,52,49,224,33,153,152,1702
680 DATA 148,8,53,49,222,160,34,50,218,154,166,41,8,27,14,49,1401
690 DATA 108,49,121,32,246,49,134,32,246,49,147,160,40,128,160,33,1734
700 DATA 158,9,48,228,25,25,49,185,160,40,128,160,33,158,7,48,1461
710 DATA 228,25,25,49,185,160,40,128,160,33,158,8,48,228,25,25,1525
720 DATA 49,185,158,149,2,31,25,231,16,68,73,86,73,83,73,79,1381
730 DATA 78,32,66,89,32,90,69,82,79,224,39,25,42,85,160,40,1232
740 DATA 128,160,33,158,10,48,228,25,25,42,129,153,153,47,128,8,1475
750 DATA 53,217,29,153,153,47,128,8,52,217,29,26,48,72,26,41,1299
760 DATA 118,25,42,129,26,53,255,158,212,157,160,20,17,148,164,15,1699
770 DATA 128,52,233,42,2,31,19,148,129,9,48,233,32,7,148,164,1425
780 DATA 15,7,217,26,49,188,153,62,153,70,153,233,3,2,82,44,1457
790 DATA 199,160,20,20,25,42,129,128,218,25,34,241,128,214,25,42,1650
800 DATA 176,142,128,1,31,17,142,218,239,68,65,80,80,69,78,68,1602
810 DATA 224,39,25,38,174,231,8,84,79,79,32,87,72,65,84,224,1545
820 DATA 39,25,42,85,153,148,128,7,128,54,233,40,5,88,148,224,1547
830 DATA 48,153,148,52,224,34,153,153,47,148,8,53,217,160,37,224,1859
840 DATA 39,26,61,208,160,34,153,7,217,160,37,128,53,233,36,5,1557
850 DATA 82,50,145,149,212,160,37,160,37,47,128,8,52,224,37,148,1676
860 DATA 149,164,25,160,37,2,31,11,148,128,164,25,224,37,25,50,1380
870 DATA 145,148,128,7,212,148,156,128,7,4,82,50,112,25,54,174,1580
880 DATA 160,41,128,53,233,36,5,82,50,200,149,212,160,41,160,41,1751
890 DATA 47,128,8,52,224,41,148,149,164,25,160,41,2,31,11,148,1379
900 DATA 128,164,25,224,41,25,50,200,148,128,7,212,148,156,128,7,1791
910 DATA 4,82,50,167,25,54,174,160,39,47,216,160,41,49,34,223,1525
920 DATA 160,37,49,34,221,157,149,2,159,149,2,13,159,152,1,13,1457
930 DATA 157,152,1,13,157,159,152,7,1,13,82,46,202,160,39,159,1500
940 DATA 157,54,224,37,160,48,212,153,47,216,29,160,52,130,1,31,1711
950 DATA 27,160,53,62,128,97,191,184,128,96,3,128,72,153,85,153,1720
960 DATA 87,153,87,153,81,128,97,25,34,62,29,153,128,52,233,32,1534
970 DATA 2,31,8,26,49,188,25,51,28,29,160,37,49,34,168,128,1013
980 DATA 0,0,0,0,7,33,221,160,41,49,34,168,128,0,0,0,841
990 DATA 0,7,33,223,29,149,224,40,160,40,149,164,25,160,47,2,1452
1000 DATA 82,51,100,160,40,128,7,224,40,160,40,156,1,82,51,108,1430
1010 DATA 25,51,73,160,40,128,164,25,224,47,29,160,51,149,2,82,1410
1020 DATA 43,248,156,249,2,82,43,248,156,128,7,220,156,149,160,47,2094
1030 DATA 228,25,156,128,232,228,25,29,128,212,153,47,128,7,216,153,2095
1040 DATA 148,128,54,147,2,31,11,153,152,148,8,53,217,25,51,174,1502
1050 DATA 148,128,7,212,148,152,4,82,51,144,25,42,76,26,49,188,1482
1060 DATA 128,212,153,148,128,54,147,2,31,19,153,148,128,8,52,224,1735
1070 DATA 54,153,153,47,148,8,53,217,25,51,218,148,128,7,212,148,1770
1080 DATA 153,47,4,82,51,179,25,42,76,26,51,28,153,180,52,236,1385
1090 DATA 87,73,84,72,5,82,42,76,153,153,47,180,8,53,217,160,1492
1100 DATA 54,232,2,82,42,76,26,51,28,153,128,52,147,5,82,42,1202
1110 DATA 76,26,49,188,153,128,53,147,2,31,5,26,49,196,160,54,1343
1120 DATA 47,222,128,224,33,142,128,8,160,33,17,128,212,160,33,164,1839
1130 DATA 15,47,216,160,33,164,15,148,158,54,160,54,5,82,52,90,1453
1140 DATA 160,33,160,33,164,15,148,128,8,52,153,7,160,33,164,15,1433
1150 DATA 152,148,158,7,128,8,8,53,7,228,15,160,33,164,15,47,1331
1160 DATA 216,148,153,47,7,212,25,52,36,148,128,7,212,148,152,4,1695
1170 DATA 82,52,36,160,33,20,25,42,129,63,26,51,28,128,212,153,1240
1180 DATA 47,216,153,148,128,54,147,2,82,52,137,148,128,7,212,148,1809
1190 DATA 152,4,82,52,115,25,42,76,153,152,148,8,53,217,153,128,1560
1200 DATA 53,147,2,31,5,26,49,196,153,47,223,128,224,33,142,128,1587
1210 DATA 8,160,33,17,128,212,160,33,164,15,47,128,7,216,160,33,1521
1220 DATA 164,15,148,159,54,153,2,31,15,160,33,129,9,60,160,33,1325
1230 DATA 164,15,62,25,52,209,148,128,7,212,148,152,4,82,52,175,1635
1240 DATA 19,25,42,129,26,51,28,26,48,72,160,49,128,7,224,49,1083
1250 DATA 160,49,129,1,82,53,3,160,49,153,49,228,11,160,49,155,1491
1260 DATA 228,9,160,49,164,11,149,2,31,7,160,49,128,228,11,25,1411
1270 DATA 42,129,231,14,84,79,79,32,77,65,78,89,32,76,79,79,1265
1280 DATA 80,83,224,39,25,42,85,149,218,155,164,15,128,53,233,93,1786
1290 DATA 2,31,12,154,128,8,218,154,149,2,82,42,169,155,164,15,1485
1300 DATA 128,52,233,91,2,31,6,154,128,7,218,155,128,7,219,155,1714
1310 DATA 142,6,82,53,26,25,44,199,151,149,2,82,34,92,233,91,1411
1320 DATA 153,7,217,155,224,40,149,219,153,47,218,155,164,15,154,52,2122
1330 DATA 153,5,82,53,149,160,42,128,7,224,42,160,42,129,1,31,1408
1340 DATA 8,129,224,42,25,53,188,160,42,160,40,228,7,128,224,46,1704
1350 DATA 155,164,15,155,164,15,47,154,8,53,217,153,232,2,82,42,1658
1360 DATA 169,25,41,118,155,128,7,219,155,142,4,82,53,92,160,40,1590
1370 DATA 219,231,19,80,82,79,67,69,68,85,82,69,32,78,79,84,1423
1380 DATA 32,70,79,85,78,68,224,39,25,42,85,160,40,219,231,19,1496
1390 DATA 84,79,79,32,77,65,78,89,32,80,82,79,67,69,68,85,1145
1400 DATA 82,69,83,224,39,25,42,85,231,13,80,82,79,67,69,68,1338
1410 DATA 85,82,69,32,69,78,68,146,7,231,13,87,73,84,72,79,1275
1420 DATA 85,84,32,83,84,65,82,84,7,224,39,25,42,85,63,128,1212
1430 DATA 212,153,47,216,142,128,2,31,6,128,14,221,29,153,148,128,1758
1440 DATA 54,224,55,160,55,49,149,1,160,55,233,45,2,13,31,13,1299
1450 DATA 153,152,148,128,8,8,53,217,25,54,58,148,128,7,212,148,1647
1460 DATA 152,128,7,4,82,54,14,232,217,153,232,2,31,11,142,129,1590
1470 DATA 9,129,8,221,129,222,29,128,212,153,47,216,153,148,128,54,1986
1480 DATA 224,55,160,55,233,45,2,31,17,153,148,52,49,222,153,152,175
1490 DATA 148,8,53,49,221,25,54,123,148,128,7,212,148,152,128,7,1611
1500 DATA 4,82,54,77,153,49,222,153,49,221,157,149,2,31,8,142,1553
1510 DATA 129,9,129,8,221,158,149,2,31,4,129,222,29,232,224,47,1723
1520 DATA 128,212,153,148,128,54,233,36,2,31,7,148,221,25,54,177,1757
1530 DATA 148,128,7,212,148,153,47,128,7,4,82,54,147,25,42,85,1417
1540 DATA 148,128,8,212,153,148,128,54,224,56,160,56,160,47,7,224,1913
1550 DATA 47,148,128,2,82,54,203,25,54,177,26,51,70,153,153,47,1420
1560 DATA 157,8,53,217,29,149,212,148,164,21,47,216,153,152,52,148,1926
1570 DATA 164,21,2,31,12,153,153,47,152,8,53,217,25,54,255,148,1495
1580 DATA 128,7,212,148,139,177,7,4,82,54,216,25,46,105,148,128,1626
1590 DATA 7,27,24,55,45,55,96,55,148,55,194,56,32,56,210,57,1172
1600 DATA 91,57,252,55,200,55,103,58,13,148,186,8,27,16,56,216,1541
1610 DATA 56,243,57,24,57,63,58,36,58,2,58,226,190,51,60,25,1264
1620 DATA 46,105,159,133,4,157,134,4,12,88,25,46,202,159,133,4,1411
1630 DATA 159,149,3,12,82,55,80,159,159,32,8,223,25,55,62,157,1420
1640 DATA 134,4,157,149,3,12,88,157,157,32,8,221,25,55,80,166,1448
1650 DATA 142,51,60,25,46,105,26,51,28,153,130,52,234,84,79,1268
1660 DATA 31,17,26,49,188,26,49,188,153,49,131,9,224,57,25,42,1264
1670 DATA 129,153,49,131,9,224,33,232,217,160,57,160,33,7,224,57,1875
1680 DATA 25,42,129,128,137,23,26,51,28,153,128,52,233,40,5,82,1282
1690 DATA 55,172,26,61,208,26,51,43,26,55,51,159,224,58,157,224,1596
1700 DATA 59,160,58,166,251,23,160,59,166,252,23,136,24,58,25,46,1666
1710 DATA 105,149,137,23,25,55,151,26,51,28,153,130,52,234,84,79,1482
1720 DATA 2,31,11,26,49,188,26,49,188,25,55,224,25,55,242,26,1222
1730 DATA 61,208,26,51,43,26,55,51,159,224,58,157,224,59,25,42,1469
1740 DATA 129,153,49,135,7,224,33,232,217,160,57,43,160,33,9,135,1776
1750 DATA 7,33,160,58,7,223,160,57,42,160,33,9,135,7,33,160,1284
1760 DATA 59,7,221,26,55,51,159,224,58,157,224,59,25,42,129,128,1624
1770 DATA 137,23,149,224,40,26,51,28,153,130,52,234,84,79,2,82,1494
1780 DATA 56,108,153,128,52,233,40,5,31,8,153,49,224,33,232,217,1722
1790 DATA 153,232,2,31,31,160,57,43,160,33,9,135,7,33,160,58,1304
1800 DATA 7,223,160,57,42,160,33,9,135,7,33,160,59,7,221,25,1338
1810 DATA 56,147,26,61,208,26,51,43,26,55,62,26,51,28,159,224,1249
1820 DATA 58,157,224,59,153,130,52
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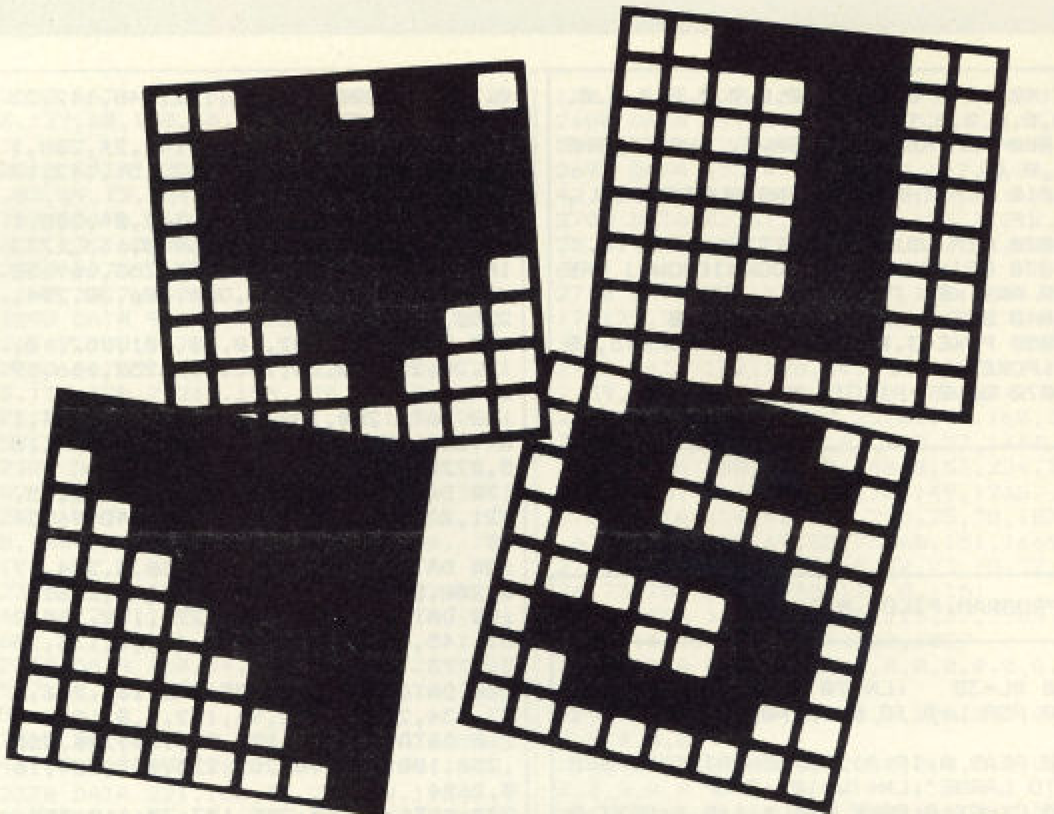
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,234,84,79,2,31,11,26,49,188,1537
1830 DATA 26,49,188,25,56,138,25,4
2,76,26,51,28,26,61,208,26,1051
1840 DATA 51,43,26,55,62,160,58,16
6,251,23,160,59,166,252,23,159,171
4
1850 DATA 166,249,23,157,166,250,2
3,160,40,149,1,31,21,160,40,166,18
02
1860 DATA 70,23,168,144,64,245,0,0
,24,58,149,224,40,25,56,201,1491
1870 DATA 168,144,64,241,0,0,24,58
,159,224,58,157,224,59,25,42,1647
1880 DATA 129,149,137,23,25,56,38,
26,48,72,153,49,191,1,153,49,1299
1890 DATA 176,4,13,82,42,76,153,49
,168,144,80,32,0,0,23,25,1067
1900 DATA 42,129,26,48,72,153,49,1
91,1,153,49,176,4,13,82,42,1230
1910 DATA 76,153,49,167,2,134,23,1
66,247,46,191,12,153,49,240,9,1717
1920 DATA 13,166,247,23,25,42,129,
26,48,72,153,49,191,1,153,49,1387
1930 DATA 176,4,13,82,42,76,153,49
,168,144,80,33,0,0,23,166,1209
1940 DATA 247,46,166,240,12,153,49
,13,166,247,23,25,42,129,26,48,163
2
1950 DATA 72,26,51,28,153,49,224,4
0,153,153,47,160,40,48,47,8,1299
1960 DATA 177,7,53,217,128,137,23,
25,56,38,128,137,23,26,61,208,1444
1970 DATA 26,51,43,159,224,33,157,
222,158,160,33,8,32,224,51,26,1607
1980 DATA 51,28,153,130,52,234,65,
84,2,31,14,26,49,188,26,49,1182
1990 DATA 188,26,51,28,25,57,139,2
5,42,76,153,128,52,233,40,2,1265
2000 DATA 31,17,26,61,208,26,51,43
,26,55,51,159,224,58,157,224,1417
2010 DATA 59,153,49,135,7,218,160,
33,131,9,224,33,158,131,9,222,1731
2020 DATA 160,51,154,10,224,51,160
,33,212,158,160,51,160,20,18,148,1
770
2030 DATA 43,154,9,135,7,33,160,58
,7,223,148,42,154,9,135,7,1324
2040 DATA 33,160,59,7,221,159,133,
4,159,149,3,12,157,134,4,12,1406
2050 DATA 157,149,3,12,31,13,159,1
66,251,23,157,166,252,23,136,24,17
22
2060 DATA 58,19,159,224,58,157,224
,59,25,42,129,149,137,23,25,57,154
5
2070 DATA 94,168,144,64,30,0,0,24,
58,25,42,129,149,224,58,149,1358
2080 DATA 224,59,149,224,57,233,19
,60,149,168,144,80,21,0,0,23,1610
2090 DATA 25,42,129,26,48,72,153,4
9,224,33,160,33,176,2,31,38,1241
2100 DATA 168,144,64,109,0,0,200,1
68,144,64,241,0,0,204,140,180,1826
2110 DATA 7,205,166,69,201,166,70,
224,60,168,144,64,93,0,0,24,1661
2120 DATA 58,25,42,129,160,33,177,
2,31,33,168,144,65,122,0,0,1189
2130 DATA 200,140,204,140,180,7,20
5,166,248,201,166,70,224,60,168,14
4,2523
2140 DATA 64,77,0,0,24,58,25,42,12
9,231,15,78,79,84,32,73,1011
2150 DATA 77,80,76,69,77,69,78,84,
69,68,224,39,25,42,85,128,1290
2160 DATA 212,153,47,216,232,224,3
8,153,148,128,54,166,34,51,2,31,18
89
2170 DATA 11,153,152,148,8,53,217,
25,58,187,148,128,7,212,148,152,18
07
2180 DATA 128,7,4,82,58,149,232,22
4,38,29,128,212,153,47,216,153,186
0
2190 DATA 148,128,54,166,34,51,2,3
1,10,153,148,128,8,52,224,38,1375
2200 DATA 29,148,128,7,212,148,152
,128,7,4,82,58,192,153,224,38,1710
2210 DATA 29,26,48,72,26,51,28,153
,49,224,33,26,49,188,149,212,1363
2220 DATA 26,51,28,148,164,13,153,
148,164,13,47,52,2,82,59,25,1175
2230 DATA 148,145,4,31,9,148,128,7
,212,25,58,244,238,83,80,82,1642
2240 DATA 73,84,69,224,39,25,42,85
,148,128,7,27,20,59,48,59,1137
2250 DATA 252,60,38,60,64,60,104,6
0,127,60,150,60,176,60,202,160,169
3
2260 DATA 33,179,1,160,33,149,4,13
,82,59,13,189,224,40,160,40,1379
2270 DATA 160,33,7,167,7,248,160,3
3,7,23,160,40,160,33,7,167,1412
2280 DATA 7,251,160,33,7,23,160,40
,160,33,7,160,33,178,4,14,1270
2290 DATA 9,167,7,254,160,33,7,23,
26,49,188,167,3,64,160,33,1350
2300 DATA 166,64,9,7,224,40,149,22
3,155,128,7,219,155,128,7,164,1845
2310 DATA 15,217,26,51,28,153,128,
52,233,40,5,82,42,76,26,49,1223
2320 DATA 188,153,128,53,233,41,5,
82,42,76,26,49,196,153,47,248,1720
2330 DATA 5,82,59,13,176,224,48,17
8,160,48,17,149,221,153,160,48,174
1
2340 DATA 184,9,128,7,184,54,224,3
4,184,212,177,177,14,160,20,18,178
6
2350 DATA 160,34,148,128,54,233,20
9,2,31,10,157,178,184,148,8,11,169
5
2360 DATA 7,221,160,20,20,157,160,
40,23,160,40,128,7,224,40,149,1556
2370 DATA 221,160,48,20,159,128,7,
223,159,245,4,31,13,155,128,7,1708
2380 DATA 219,155,164,15,217,25,59
,134,25,42,129,26,60,19,168,144,16
01
2390 DATA 80,21,0,0,46,160,40,13,1
68,144,80,21,0,0,23,25,821
2400 DATA 42,129,160,33,149,4,160,
33,183,1,13,82,59,13,178,160,1399
2410 DATA 33,11,224,40,29,26,60,19
,168,144,80,21,0,0,46,166,1067
2420 DATA 255,160,40,8,12,168,144,
80,21,0,0,23,25,42,129,26,1133
2430 DATA 60,19,26,61,208,26,51,43
,159,168,144,80,0,0,0,178,1223
2440 DATA 160,33,9,7,23,157,168,14
4,80,0,0,0,178,160,33,9,1161
2450 DATA 7,128,7,23,25,42,129,26,
60,19,168,144,80,23,0,0,881
2460 DATA 46,160,40,13,168,144,80,
23,0,0,23,25,42,129,26,60,979
2470 DATA 19,168,144,80,29,0,0,46,
160,40,13,168,144,80,29,0,1120
2480 DATA 0,23,25,42,129,26,60,19,
168,144,80,23,0,0,46,166,951
2490 DATA 255,160,40,8,12,168,144,
80,23,0,0,23,25,42,129,26,1135
2500 DATA 60,19,168,144,80,29,0,0,
46,166,255,160,40,8,12,168,1355
2510 DATA 144,80,29,0,0,23,25,42,1
29,153,153,47,182,8,53,217,1285
2520 DATA 153,49,224,40,160,40,149
,4,160,40,191,1,13,82,42,76,1424
2530 DATA 160,40,168,144,80,39,0,0
,160,33,7,23,25,42,129,128,1178
2540 DATA 212,153,47,216,153,49,12
9,10,224,33,160,33,149,2,82,41,169
3
2550 DATA 118,153,148,128,54,224,3
4,160,34,233,48,4,160,34,233,57,18
22
2560 DATA 1,13,160,34,233,32,5,12,
82,61,97,148,128,7,212,148,1373
2570 DATA 152,128,7,4,82,61,2.160,
32,31,8,149,224,32,25,34,1131
2580 DATA 62,160,33,160,33,33,2,31
,38,160,33,232,228,15,160,33,1413
2590 DATA 128,7,212,142,160,20,17,
148,128,8,148,164,15,228,15,19,155
9
2600 DATA 142,128,8,232,228,15,142
,128,8,206,25,34,79,25,34,79,1513
2610 DATA 153,152,148,128,8,8,53,2
17,160,33,142,3,31,13,142,153,1544
2620 DATA 228,15,142,128,7,206,25,
34,79,160,33,160,33,33,2,31,1316
2630 DATA 10,160,33,153,228,15,25,
34,79,160,33,128,4,31,30,142,1265
2640 DATA 212,128,128,14,160,20,18
,148,148,128,8,164,15,228,15,19,15
53
2650 DATA 142,128,7,206,128,153,22
8,15,25,34,79,142,212,160,33,33,17
25
2660 DATA 128,7,128,14,160,20,18,1
48,148,128,8,164,15,228,15,19,1348
2670 DATA 142,128,7,206,160,33,33,
128,7,153,228,15,25,34,79,26,1404
2680 DATA 51,28,153,128,52,233,40,
5,82,42,76,26,49,188,128,212,1493
2690 DATA 153,47,216,148,152,1,82,
42,76,153,148,128,54,233,41,2,1676
2700 DATA 82,61,251,148,128,7,212,
25,61,228,153,148,128,8,52,224,191
6
2710 DATA 37,153,153,47,148,8,53,2
17,128,212,160,37,47,216,160,37,18
13
2720 DATA 148,128,54,233,44,2,82,6
2,39,148,152,1,82,42,76,148,1441
2730 DATA 128,7,212,25,62,15,160,3
7,148,128,8,52,224,41,160,37,1444
2740 DATA 160,37,47,148,8,53,224,3
7,29,160,43,128,2,31,10,149,1266
2750 DATA 224,43,149,215,25,38,107
,63,237,66,82,69,65,75,60,151,1669
2760 DATA 31,19,231,8,32,73,78,32,
76,73,78,69,60,155,128,8,1151
2770 DATA 129,9,62,151,15,31,3,63,
149,215,25,34,62,79,0,0,1027
2780 DATA 0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0
2790 DATA 0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0
2800 DATA 0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0
2810 DATA 0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0
2820 DATA 0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0
2830 DATA 0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0
2840 DATA 0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0
2850 DATA 32,154,32,146,32,32,31,1
8,224,32,154,32,146,160,4,32,1261
2860 DATA 31,18,32,32,154,32,146,3
2,31,18,160,6,32,154,32,146,1056
2870 DATA 32,31,18,160,6,32,154,32
,146,160,5,32,87,79,0,0,974
2880 DATA 0,0,0,84,69,0,0,0,0,84
,87,0,0,0,0,324
2890 DATA 0,70,49,0,0,0,0,73,78,
0,0,0,0,0,72,342
2900 DATA 82,0,0,0,0,86,82,0,0,0
,0,0,66,84,0,400
2910 DATA 0,0,0,0,80,84,0,0,0,0,
79,79,0,0,0,322
2920 DATA 0,0,83,88,0,0,0,0,71,6
7,0,0,0,0,0,309
2930 DATA 68,82,0,0,0,0,76,73,0,
0,0,0,0,80,0,379
2940 DATA 0,0,0,0,0,83,128,0,0,0
,0,79,128,0,0,418
2950 DATA 0,0,0,83,80,0,0,0,0,67
,200,0,0,0,0,430
2960 DATA 0,70,128,0,0,0,0,73,0,
0,0,0,0,0,79,350
2970 DATA 0,0,0,0,0,71,0,0,0,0,0
,0,82,0,0,153
2980 DATA 0,0,0,0,76,0,0,0,0,0,6
5,128,0,0,0,269
2990 DATA 0,0,68,0,0,0,0,0,90,0,
0,0,0,0,0,158
3000 DATA 86,0,0,0,0,0,69,0,0,0,
0,0,0,66,0,221
3010 DATA 0,0,0,0,0,84,0,0,0,0,0
,84,49,0,0,217
3020 DATA 0,0,0,65,0,0,0,0,0,68,
128,0,0,0,0,261
3030 DATA 0,85,0,0,0,0,0,83,0,0,
0,0,0,0,69,237
3040 DATA 128,0,0,0,0,78,128,0,0
,0,0,0,87,128,0,549
3050 DATA 0,0,0,0,81,0,0,0,0,0,8
4,128,0,0,0,293
3060 DATA 0,0,67,76,0,0,0,0,75,0
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3070 DATA 76,128,0,0,0,0,89,0,0,
0,0,0,0,80,70,443
3080 DATA 0,0,0,0,0,86,128,0,0,0
,0,74,0,0,0,288
3090 DATA 0,0,0,78,76,0,0,0,0,77
,0,0,0,0,0,231
3100 DATA 0,67,0,0,0,0,0,68,83,0
,0,0,0,0,68,286
3110 DATA 211,0,0,0,0,66,128,0,0
,0,0,0,67,128,0,600
3120 DATA 0,0,0,0,80,128,0,0,0,0
,90,49,0,0,0,347
3130 DATA 0,0,88,49,0,0,0,0,89,4
9,0,0,0,0,0,275
```

```
3140 DATA 68,84,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,152
4000 REM READY TO SAVE. CHANGE THE
 ,8 IN
4010 REM THE SAVE INSTRUCTION TO ,
1 IF
4020 REM USING CASSETTE.
4030 PRINT"[CLEAR][DOWN][DOWN] PRE
SS ANY KEY TO SAVE"
4040 GETK$:IFK$=""THEN 4040
4050 POKE43,01:POKE44,08:POKE45,18
5:POKE46,64
4070 SAVE "PILOT",8
```

PROGRAM:PILOT M/C

```
10 BL=35   :LN=70   :SA=49152
20 FOR L=0 TO BL:CX=0:FOR D=0 TO 1
5
30 READ A:IF A>255THENPRINT"NUMBER
 TO LARGE";LN+(L*10):STOP
40 CX=CX+A:POKE SA+L*16+D,A:NEXT D
50 READ A:IF A><CX THENPRINT"ERROR
 IN LINE";LN+(L*10)
60 NEXT L
70 DATA 32,96,165,162,0,189,0,2,20
1,0,240,4,232,76,5,192,1596
80 DATA 142,255,3,173,1,2,201,0,20
8,3,76,0,192,96,162,0,1514
90 DATA 169,0,160,224,132,70,160,0
,132,69,145,69,230,69,208,250,2087
100 DATA 230,70,208,246,134,69,162
,196,134,70,162,200,165,247,160,0,
2453
110 DATA 145,69,230,69,208,2,230,7
0,228,70,208,244,96,162,148,142,23
21
120 DATA 0,221,162,24,142,24,208,1
62,59,142,17,208,96,162,151,142,19
20
130 DATA 0,221,162,21,142,24,208,1
62,27,142,17,208,96,169,0,133,1732
140 DATA 254,169,32,133,253,169,50
,229,252,70,251,38,254,106,38,254,
2552
150 DATA 133,252,10,10,101,252,10,
10,38,253,10,38,253,133,252,166,19
21
160 DATA 254,189,220,192,133,254,1
64,251,234,234,165,253,41,15,24,10
5,2728
170 DATA 4,133,253,177,252,162,15,
221,224,192,240,4,202,16,248,96,24
39
180 DATA 165,69,240,6,138,5,254,17
0,208,8,138,73,255,5,254,73,2061
190 DATA 255,170,189,224,192,164,2
51,145,252,24,165,252,105,0,133,25
2,2773
200 DATA 165,253,105,212,133,253,1
73,134,2,145,252,96,1,2,4,8,1938
210 DATA 32,126,123,97,124,226,255
,236,108,127,98,252,225,251,254,16
0,2694
220 DATA 0,169,255,133,70,169,255,
72,72,165,251,197,249,48,16,168,22
89
230 DATA 165,249,133,251,152,133,2
49,164,250,165,252,132,252,133,250
,165,3095
240 DATA 249,197,251,240,43,72,24,
101,251,74,133,249,170,232,165,250
,2701
250 DATA 72,165,252,197,250,240,17
,24,101,250,74,133,250,197,252,176
,2650
260 DATA 4,230,250,80,3,24,105,1,1
68,138,72,152,72,76,15,193,1583
270 DATA 165,252,197,250,240,13,16
5,249,72,165,250,72,166,251,165,25
2,2924
280 DATA 76,39,193,138,72,165,70,2
4,10,144,2,9,1,133,70,144,1290
290 DATA 3,32,109,192,104,170,104,
133,252,104,133,251,201,255,208,1,
2252
300 DATA 96,104,133,250,104,133,24
9,76,15,193,169,1,133,69,169,255,2
149
310 DATA 133,70,165,252,201,8,48,1
0,56,233,8,133,252,230,70,76,1945
320 DATA 132,193,165,251,201,8,48,
10,56,233,8,133,251,230,69,76,2064
330 DATA 148,193,169,0,197,253,240
,14,133,253,165,251,56,233,8,230,2
543
340 DATA 69,133,251,76,148,193,160
,0,132,53,132,54,162,40,24,165,179
2
350 DATA 53,101,70,133,53,165,54,1
05,0,133,54,202,208,240,24,165,176
0
360 DATA 53,101,69,133,53,165,54,1
05,0,133,54,162,3,24,38,53,1200
370 DATA 38,54,202,208,248,198,252
,24,165,53,101,252,133,53,165,54,2
200
380 DATA 105,0,133,54,24,165,54,10
5,196,133,54,165,247,145,53,24,165
7
390 DATA 165,54,105,27,133,54,166,
251,169,0,56,106,202,208,252,133,2
081
400 DATA 251,120,165,1,41,253,133,
1,177,53,170,165,1,9,2,133,1675
410 DATA 1,88,165,248,201,0,240,6,
138,5,251,145,53,96,169,255,2061
420 DATA 69,251,37,251,145,53,0,0,
0,0,0,0,0,0,0,0,806
500 PRINT"[CLEAR][DOWN][DOWN][DOWN
][DOWN] NOW LOAD AND RUN PILOT"
```

Listings will be much easier to enter with our new system.



LISTINGS

COMMODORE LISTINGS ARE RATHER well known for the horrible little black blobs that always abound. Unfortunately the graphics characters which are used to represent graphic and control characters do not reproduce very well and they are also difficult to find on the Commodore keyboard.

In future all control and graphics commands will be replaced by a mnemonic within square brackets. This mnemonic is not typed out as printed in the magazine but rather the corresponding key or keys on the keyboard are pressed. For example [RIGHT] means press the cursor right key, you do not type in [RIGHT]. All of the keywords, what keys to press and how they are shown on the screen are shown below.

Any character that is accessed by pressing shift and a letter will be printed as [Sletter].

[SA] shift and A
[S+] shift and +

Any character that is accessed by pressing the Commodore key and a letter will be printed as [Cletter]

[CA] Commodore and A
[C+] Commodore and +
[C1] Commodore and 1

If any characters are repeated the mnemonic will be followed by a number. This number is how many times you should enter the character. Any number of spaces over one will also be represented in this form

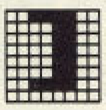
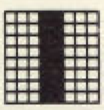
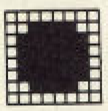
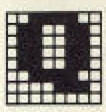
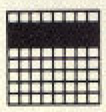
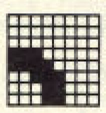
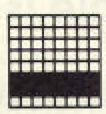
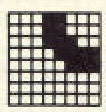
[RIGHT10] press cursor right 10 times
[C+10] press Commodore and + 10 times
[SPC10] Press the space bar 10 times

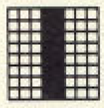
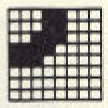
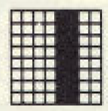
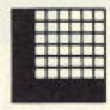
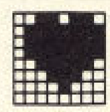
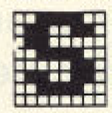
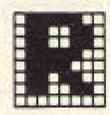
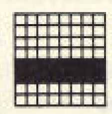
Any other characters should be easily recognisable for example CTRL-N means press CTRL and N and LEFT-ARROW means press the left arrow.

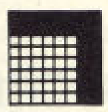
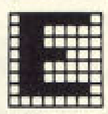
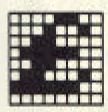
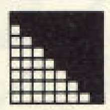
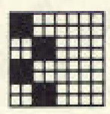
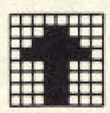
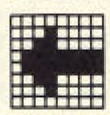
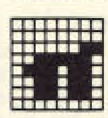
Any number of mnemonics can be enclosed in brackets for example

[SA10,SPC10,SA10]

means type 10 shift A's 10 spaces and another 10 shift A's.

Mnemonic	Symbol	what to press
[RIGHT]		left/right
[LEFT]		shift left/right
[UP]		Shift & up /down
[DOWN]		up/down
[F1]		f1
[F2]		shift & f1
[F3]		f3
[F4]		shift & f3

Mnemonic	Symbol	what to press
[F5]		f5
[F6]		shift & f5
[F7]		f7
[F8]		shift & f7
[CLEAR]		shift & CLR /HOME
[HOME]		CLR/HOME
[RVSON]		CTRL & 9
[RVSOFF]		CTRL & 0

Mnemonic	Symbol	what to press
[BLACK]		CTRL & 1
[WHITE]		CTRL & 2
		CTRL & 3
[CYAN]		CTRL & 4
[PURPLE]		CTRL & 5
[GREEN]		CTRL & 6
[BLUE]		CTRL & 7
[YELLOW]		CTRL & 8

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